ELECTRICAL WORLD

ANNUAL PROGRESS AND STATISTICAL NUMBER

•

JANUARY 2, 1932

McGraw-Hill Publishing Co., Inc.

THE BOOM—From 1900 to 1929 was the growth period for all branches of the electrical industry. New products and services were commercialized and national electrification proceeded at a rapid pace very largely because of popular demand for electrical products and services. By 1929 the branches of the industry had a capital investment of about $22,000,000,000 with a total annual revenue of about $6,000,000,000 for a multitude of products and services.

THE DEPRESSION—In common with all industry the electrical branch suffered from the depression that began in 1929 and still continues. But, relatively speaking, it suffered less than any other industry. It had less decrease in revenue, greater stability in prices, fewer individual corporation failures and a lessened volume of business than industry in general. On a total industry basis the decrease in dollar volume is about 10 per cent as contrasted with the general average of 30 per cent decrease from 1929 levels for national business.

THE FUTURE—Prospects for immediate business increases in the electrical industry are not encouraging. The depression still continues for all industry branches. Yet all markets for electrical products and services are still unsaturated, public acceptance is high and inventive genius is still at work. Thus aggressive selling can be used to bring more business even under present conditions. Moreover the electrical industry is certain to respond very quickly to any betterment in national business. Undoubtedly the future of the industry promises to be on a par with its past.

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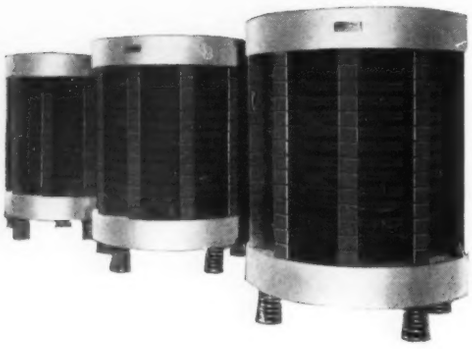

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Kings County Gas & Elec. Co., Brooklyn
New York Edison Co.
Philadelphia Electric Co.
Southern Wisconsin Power Co.
Turners Falls Power Co., Mass.
Utica Gas & Electric Co.
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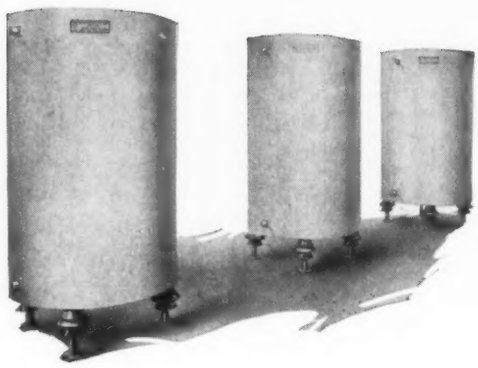

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National Tube Co.
American Brown Boveri Corp.
Northwestern Electric Co., Portland, Ore.
City of Tacoma
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Stone & Webster Properties
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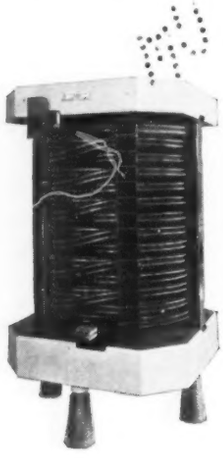

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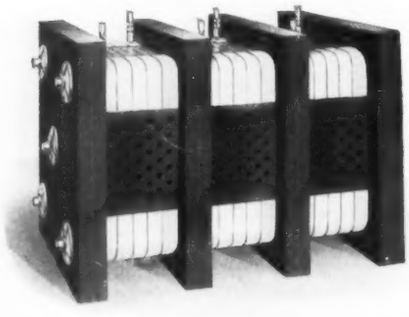

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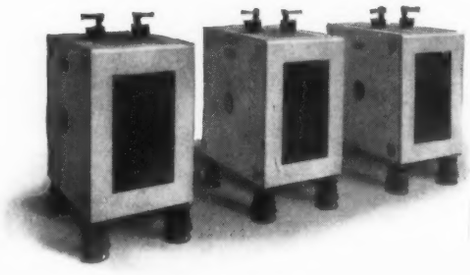

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Light in the Gloom

We fail to predict the date for business recovery in this isue

All prophets have been confounded and even editors have become modest and might well take to heart the little verse of Will Carleton:

> Boys flying kites haul in their white-winged birds;
> You can't do that way when you're flying words.
> "Careful with fire" is good advice, we know;
> "Careful with words" is ten times doubly so.
> Thoughts unexpressed may sometimes fall back dead;
> But God himself can't kill them when they're said.

But a restoration of optimism

and a reconsecration to constant and aggressive expansion should result from a study of this issue of ELECTRICAL WORLD. The perspective of two decades and the facts presented paint no picture of gloom. This industry and this country are harassed and trouble-ridden, but they still vibrate with promise. Every lusty American should still be glad to be alive and quite literally kicking.

Our statistics support optimism

We have compiled all the essential facts about the industry and interpreted their meaning, and the result is relatively very encouraging. People are still using electricity and are paying for the privilege. Buyers of equipment still manage to pay more than a billion dollars for electrical products. Bankruptcies and failures are conspicuous by their absence. In every branch of the industry the morale is splendid and the personnel adequate and competent. Only fear and contagion form the foundations for any lack of confidence. The facts tell the true story.

Consider the scene

Homes and offices are bright with electric light. Factories are using electric motors and processes. Executives, engineers and operators are busy with plans for more business or for improvements.

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Research men are delving into the treasures of science, seeking new knowledge. All markets for products and services are unsaturated and the public welcomes them. Just over the horizon lie splendid prospects that new branches of the industry will spring up to broaden and strengthen business channels. Was there ever a better age in which to live? Were prospects ever brighter for new and startling developments? Optimism, under these conditions, is sensible. It is evidence of reason and high spirits inspired by both facts and faith.

Those without genius can go to work

Most of us make no claim to have special gifts or the background to seek the unknown. But we have our share of energy and power and can look about us to find ample use for our talents. Our industry is new and has grown rapidly. Many cumbersome, traditional and inefficient things exist that we can fix. Our machine clanks and groans as it drives along. It goes chiefly because it is indispensable. Hard work, common sense and ordinary business ability can redesign it, oil it and speed it up. This is our important part in progress. We can develop markets, improve distribution, make organizations more efficient and apply our intelligence to improve every branch of the industry.

We have heard it said that the railroads need new ideas and not higher rates. Perhaps we too are becoming contented and ingrown. We might use ideas ourselves and even contribute them to the railroads, especially if they are electrical.

Stock taking for economies

has been forced upon every organization in recent days. Even editors have been affected by the depression and have taken stock. No one has been immune to the results of a cost diagnosis. But this whole process has been done from the wrong point of view too frequently. The object has been to save money and not make it. The attempt has been to reduce all expenditures to the "get by" scale of activity. We confess that this was the point of view with which we started our stock taking.

But we believe we see the light

The compilation of the data and opinions in this issue gave us a new point of view. It leads us to the strong conclusion that our destiny rests in our own hands. It leads us to study the result we would get by making business what we want it to be and not letting routine business fluctuations force us to inert conformity. Every branch of this industry is very largely capable of making its own business independently of general business; we can go ahead if we have the will to do so and if we adapt our practices to the market conditions that exist today. Thus our stock taking should be made from the point of view of grasping our business opportunities and not involve lowering ourselves into a well of economic desolation. This is not a "Pollyanna" conclusion. Any electrical man who reads this issue will reach this conclusion. It sticks out like the Empire State tower.

▼

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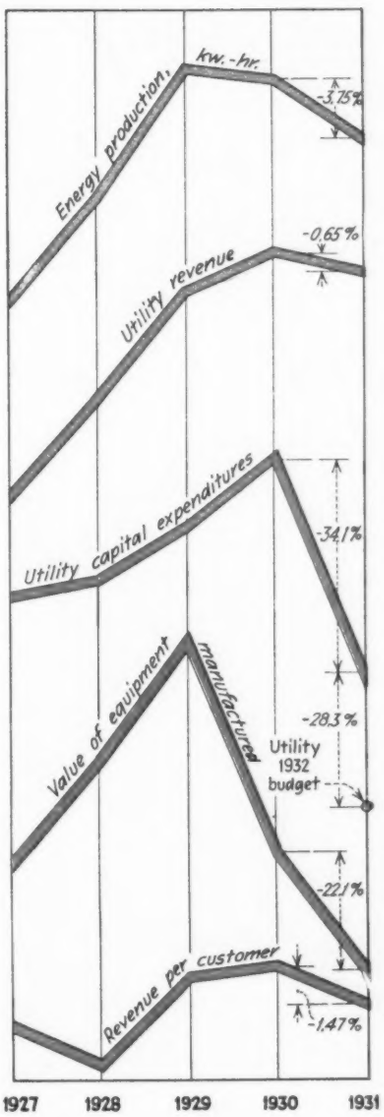


Manufacturers worst hit in 1931

—**Value of equipment produced** falls 22 per cent in 1931 as utilities cut capital expenditures to meet depression days. 1931 outlay 34 per cent below 1930. 1932 to be 28 per cent less—*p. 53.*

—**President Trumbull, N.E.M.A.** urges faith and work for a better future, saying: "We can bring about better business and we can make business stable if we will." Group action the key—*p. 31.*

Energy output drops 3.75 per cent

—**Depression days change little** the production figures for the electric light and power companies. If normal trends be disregarded, only 3.75 per cent fall from preceding year is involved—*p. 17.*

—**President Owens of N.E.L.A.** views the home market as the most promising field for promotional efforts. Industry is in splendid shape to benefit when general prosperity returns—*p. 32.*

Utility revenues affected but little

—**Power company revenues fall** but 0.65 per cent in face of the all-but-catastrophic decline in general business activity. Stability of the industry and of its earning power once more proved—*p. 17.*

—**$1,491,000,000 was financed** despite extremely adverse security market conditions. Refinancing amounted to $750,000,000. Customer ownership sales ratio increased in 1931—*p. 55.*

1932 utility budget $454,000,000

Manufacturers Hit Worst in 1931— Utility Revenue Drop Slight

OF THE several groups that compose the electrical industry the manufacturers of apparatus and equipment fared the worst in the ill-starred year of 1931. Utility companies suffered relatively little, if an energy output drop of some 3.75 per cent and a revenue fall of less than 1 per cent can indeed be properly called suffering. The value of equipment manufactured, however, went off some 22 per cent from the figures for 1930, and it may be recalled that 1930 had already placed the value of electrical products back on the basis of 1927. As for the year to come, even the most confirmed optimist will find little to comfort him in 1932 prospects. The utilities will probably do just about as well, perhaps a little worse or even a little better should general business begin to pick up, but there is no bright gleaming star of hope for the companies that make the sinews of the electrical industry. The utility budget for 1932 capital expenditures is off 28.3 per cent from the total spent in 1931, and 1931 outlays were 34.1 per cent under those for 1930.

$454,000,000 is 1932 budget

Upon the basis of information supplied by executives of the electric light and power industry the budget for 1932 will, it is anticipated, total some $454,000,000. Of this, about 12 per cent is allocated for transmission construction, 18 per cent for generation and 64 per cent for distribution. Of course budgets, while good straws to show how the wind may blow, are not to be accepted as inflexible indicators. For 1931 the estimated budget figure was $894,000,000, virtually all of which was definitely approved by management for expenditure, but the 1931 outlay was actually but $633,000,000. If general business and the security market improve, the inconsistency between intent and performance may shift the other way. As in virtually all other business, natural growth of population may increase the demands upon the purveyors of electrical service tremendously when happy days are here again. The trend line of years shows an ever upward swing for America and her aggregated industries. We are away behind now on the basis of so-called normal growth, and some fast sprinting may soon be needed.

Latest figures for 1931 output of electrical energy show 86,679,000,000 kw.-hr., as against 89,952,000,000 kw.-hr. in 1930. This is a drop of but 3.75 per cent. Careful economies and planned expenditures were made on almost all properties, for the corresponding revenue figures fell off but 0.65 per cent, from $2,151,000,000 to $2,137,000,000. The inherent stability and normal growth of the industry placed it beyond the difficulties which beset so many other industries in 1931, and with executive foresight as to policies, expenditures and continued load-building efforts left it virtually untouched by the withering hand of depression.

Utility properties in states bordering the Atlantic and Pacific coasts showed, in the aggregate, increases for 1931 revenue as compared with 1930, but properties in the great central area of the country showed regionally either less than 0.8 per cent change or a definite drop.

$1,314,000,000 for 1931 manufactures

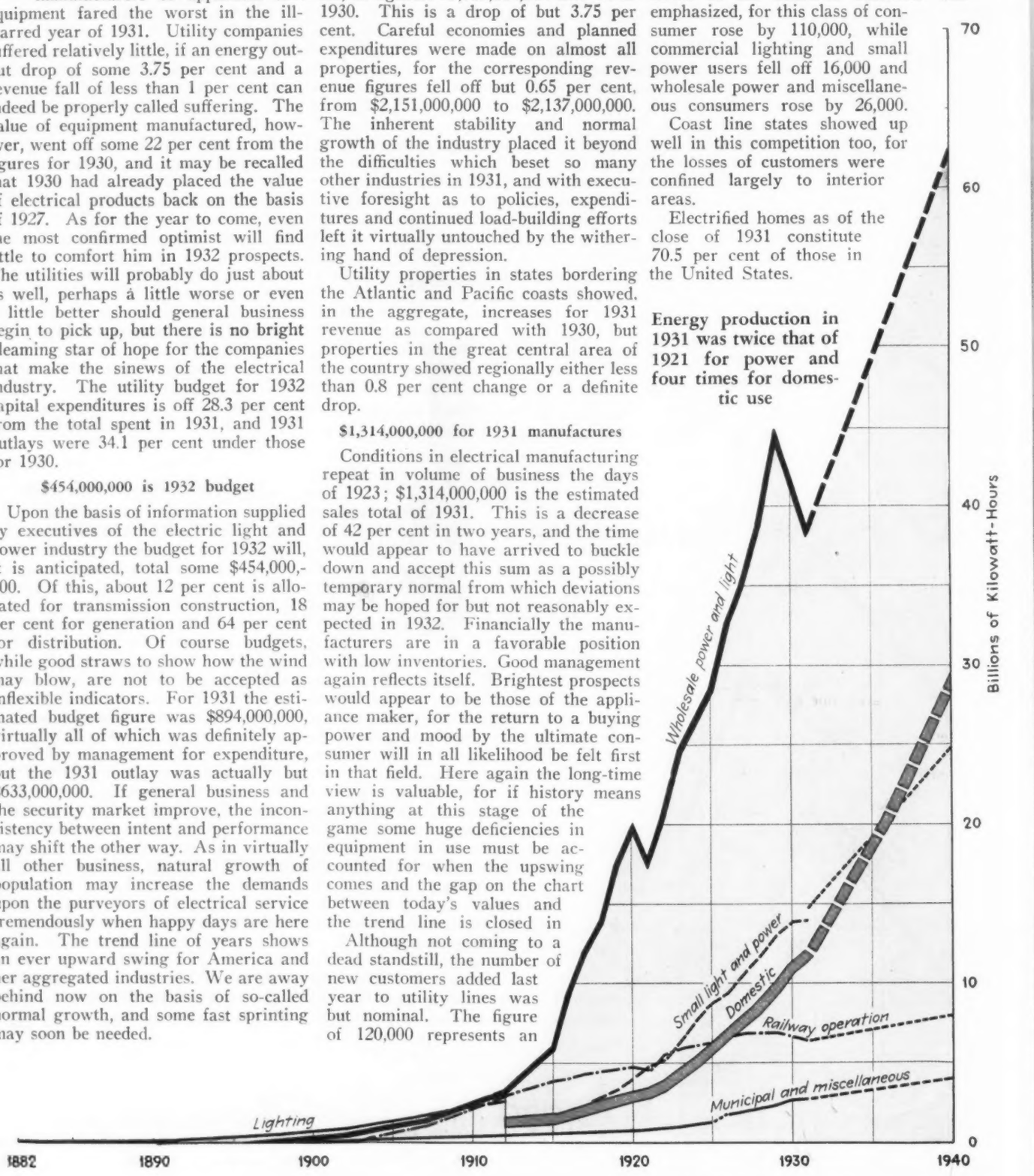
Conditions in electrical manufacturing repeat in volume of business the days of 1923; $1,314,000,000 is the estimated sales total of 1931. This is a decrease of 42 per cent in two years, and the time would appear to have arrived to buckle down and accept this sum as a possibly temporary normal from which deviations may be hoped for but not reasonably expected in 1932. Financially the manufacturers are in a favorable position with low inventories. Good management again reflects itself. Brightest prospects would appear to be those of the appliance maker, for the return to a buying power and mood by the ultimate consumer will in all likelihood be felt first in that field. Here again the long-time view is valuable, for if history means anything at this stage of the game some huge deficiencies in equipment in use must be accounted for when the upswing comes and the gap on the chart between today's values and the trend line is closed in.

Although not coming to a dead standstill, the number of new customers added last year to utility lines was but nominal. The figure of 120,000 represents an increase of less than one-half of 1 per cent. Once more, though, the significance of the domestic customer was emphasized, for this class of consumer rose by 110,000, while commercial lighting and small power users fell off 16,000 and wholesale power and miscellaneous consumers rose by 26,000.

Coast line states showed up well in this competition too, for the losses of customers were confined largely to interior areas.

Electrified homes as of the close of 1931 constitute 70.5 per cent of those in the United States.

Energy production in 1931 was twice that of 1921 for power and four times for domestic use



In spite of adverse stock and bond market conditions more than $1,491,742,000 was raised in 1931. Of this but 36 per cent was expended for new construction, the balance of 64 per cent being devoted to refunding purposes, while many new developments, mergers, etc., which might otherwise have been undertaken were either postponed or abandoned because of general conditions. The total amount of capital secured for all purposes in 1931 was within 6 per cent of the 1930 total and was only previously exceeded by the volumes involved for 1927 and 1928. It is estimated that at least $1,500,000,000 is the annual capital requirement of the industry. Its basically steady nature and necessary service as well as splendid corporate position at the present time would seem to be assurance of a relatively favored financing condition even in highly unfavorable general markets.

For the present, at least, senior financing is demanded by the investor, and just how far security relationships will be affected is a dominant question. The average cost of mortgage bond money during the year was 4.67 per cent, as against 4.97 per cent in 1930 and around 5.40 per cent in 1929.

The promise of the domestic load

When all other markets are analyzed and weighed it is found that the domestic consumer remains the best bet of the electrical industry. Average use per domestic customer rose from 550 kw.-hr. in 1930 to 580 kw.-hr. in 1931. Today refrigerators, ranges and water heaters account for a third of residential energy sales and aggregate the total domestic sales of 1922. Total energy use by appliances represents nearly half of the sales to the home market.

Still the field is but lightly touched. Only one customer in nine has an electric refrigerator, one in twenty a range and one in eighty a water heater. We haven't begun to light. The domestic market has a legitimate appeal for the commercial men of the industry.

Stocks back to 1925 prices

Security prices crashed heavily in 1931, as the utilities suffered along with the great fall of all stocks and many bond issues. The average price of 37 utility common stocks closed the year at 36, after reaching a high point for the year of 74 in March. Average prices of holding company stocks are now around nine times earnings, against a high of 30 times earnings in 1929.

Electrical manufacturing companies followed other industrial groups closely. The average of ten stocks in this division showed a decline of 67 per cent from this year's high of 43 to a low of 14 for the period.

Customer sales of securities rendered first aid in a difficult situation. Compilations show an increase in 1931 over 1930 as to both number of transactions and total value of securities sold.

Utility taxes mounting

More than half a million dollars a day is the cost of the electric utilities of taxation. Ten cents of every dollar paid by the ultimate electric consumer goes out in the form of taxes. This appears to be a trend of considerable moment, for taxes are rising faster than revenues and the coming years would appear to portend danger if politicians persist in their present attitude.

▼

Electric Furnace Sustains Heat at 3,600 deg. C.

Recent experiments under the direction of Dr. Edwin Fitch Northrup of Princeton, vice-president and technical adviser of the Ajax Electrothermic Corporation, Trenton, N. J., are reported to have established a heating method with an achieved limit at the present time of 3,600 deg. C., but unlimited in size and control. Representing, it is thought, a distinct gain in high-temperature technique, the method not only shows it to be commercially practicable to maintain a controlled temperature of 3,000 deg. C. for a long period—a result not obtainable in furnaces of usual design—but in accomplishing the task the limits of controlled volumes of heat were pushed up nearly 1,000 deg. C.

The furnace used, which was of the Ajax-Northrup inductor type, comprised an Acheson graphite energy-absorbing crucible packed in a refractory insulation of lampblack known as thermatomic carbon, which has the property of giving off very little or no gas at the highest temperature. Arrangement was made to establish a temperature gradient through the heat insulation to a water-cooled inductor coil. Even while graphite was being vaporized at 3,600 deg. C., on the inside, the outside of the furnace, only three inches away, remained cold. The chamber in the experimental tests was of about a cubic foot capacity, and a similar commercial furnace was designed to be built in any size.

By the use of the new method a large volume has been heated to the vaporization point of graphite and the temperature has been maintained just below the vaporization point and controlled to within a few degrees' variation for a period exceeding five hours, but which might have been extended indefinitely.

The actual experiments were made by Frank T. Chesnut, electrical engineer for the Ajax Electrothermic Corporation, who foresees possible developments of an extraordinary nature.

▼

Economies by N. E. L. A. Permit Reduction in Dues

As the result of an economy program which was started about eighteen months ago the National Electric Light Association has passed along to its class A members the benefits of such economies in reducing the dues of electric light and power companies by nearly 35 per cent.

Formerly charged on the basis of one-twelfth of 1 per cent of gross revenue, the basis now in effect is one-twentieth of 1 per cent. The curtailment of expenses has been carefully planned and instituted so that no impairment of association services will be involved. Some reduction in the liberality of committee appropriations will, it is said, follow this year, but neither the efficiency of the organization nor its service to members will be notably affected.

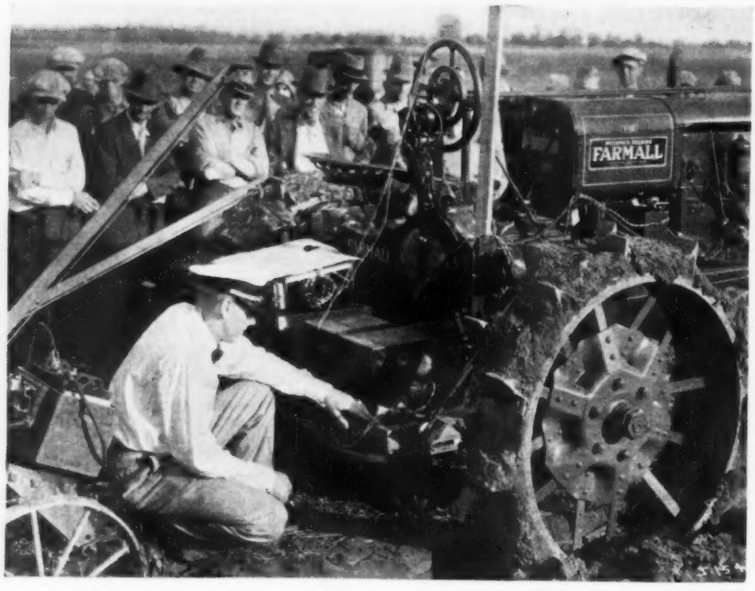
The reduced dues represent very largely the result of a series of economies begun to meet changing business conditions in general industry and designed to permit member companies in turn to reduce their expenses. Virtually all the association economy measures were effected some months previous to the decision to reduce the dues.

▼

Thompson Commission Counsel

Houston Thompson, former member of the Federal Trade Commission and a lawyer understood to sympathize with the viewpoint of "progressive" legislators on power matters, has been appointed by the Federal Power Commission as special attorney in the New River case now pending in the United States District Court for the Western District of Virginia.

RADIO ACTS AS HIRED MAN IN MIDDLE WEST



WILL the machine age extend to the farm to such a degree that one man seated at a control desk may supervise and direct numerous radio-controlled gas-engine-driven tractors? Indiana farmers recently witnessed the operation of a radio-controlled plow on the farm of an International Harvester Company dealer which holds bright promise of such development. The received impulses operated selective switches and relays controlling different operations, motive power for steering, lifting the plows, etc., being supplied by a battery on the tractor. Two or more plows, it is maintained, could be controlled by one operator in this manner and stationary machines started and stopped by radio from some central point.

▼

Final Contracts Signed for Boulder Dam Power

Secretary of the Interior Wilbur has signed final contracts for the allocation of power from Boulder Dam. The contracts were drawn in conformity with the general allocation made in April, 1930.

The municipalities of Pasadena, Glendale and Burbank contracted for 4 per cent of the 6 per cent allocated in April, 1930, for use of municipalities, and the city of Los Angeles took the remaining 2 per cent, bringing its total allocation to 15 per cent. The Los Angeles Gas & Electric Corporation and the Southern Sierras Power Company also contracted for power which has been assigned to them from the utilities' allocation by the Southern California Edison Company.

The Secretary's action closed the question of power from Boulder Dam until Arizona or Nevada requests energy, as they are authorized to do at any time. The power will be sold at the switchboard for 1.63 mills per kilowatt-hour.

▼

Ohio May Now Seek to Tax Power Imported Wholesale

When in settling the Ohio Fuel Gas Company case the United States Supreme Court found that the State of Ohio could place an excise tax on gas—and inferentially on electrical energy—imported from another state for retail sale in Ohio, the nation's highest tribunal did not say whether the same principle would apply to gas or electricity imported for wholesale disposition. This point is now being raised by Attorney-General Gilbert Bettmann, who says:

Whether under the East Ohio decision we can recover taxes on the wholesale business done by the gas and electric companies is the question. What the Supreme Court decided was that on gas or electricity brought from West Virginia and sold at retail in Ohio Ohio had a right to levy a tax, although the company claimed that as the commodity was in continuous motion from outside the State of Ohio it was in interstate commerce and therefore exempt from excise taxes here. We disputed that and contended that interstate commerce ended when gas was distributed locally. The Supreme Court upheld our contention, and back taxes in the amount of $1,676,885 have already been paid to the state under that decision.

The question which has been pending between us since is whether Ohio can levy an excise tax on gas or electricity coming without the state but which is sold at wholesale in Ohio. What the Attorney-General of Ohio is contemplating is whether both companies, the wholesaling company and the retailing company, are not liable for the tax.

▼

Democratic House Chairman Now for Muscle Shoals

Preliminary hearings on proposed Muscle Shoals legislation will take place before the House military affairs committee in the near future. With the Democratic organization of the House, Representative Percy Quinn of Mississippi became chairman of the committee. He has appointed a subcommittee consisting of the following members to deal with Muscle Shoals legislation: Representatives McSwain of South Carolina, Johnson of Oklahoma, Pettengill of Indiana, Thomason of Texas, Ransley of Pennsylvania, W. R. Johnson of Illinois and James of Michigan. Representative Quinn will head the subcommittee.

Before starting public hearings Mr. Quinn intends to call members of the President's Muscle Shoals Commission before the committee. In particular, he desires to clarify the status of the Muscle Shoals plant from the fertilizer production standpoint. He would like to know what caused the President's commission to emphasize the fertilizer production possibilities of the project in face of the report obtained from the Department of Agriculture minimizing the potential value of the fertilizer facilities.

▼

Insull Indiana Mergers Receive Official Sanction

Merger of five Insull-controlled utilities into two large corporations has just been approved by the Indiana Public Service Commission. The Indiana Electric Corporation will be merged with the Public Service Company of Indiana, and the Attica Electric Company and Wabash Valley Electric Company will be merged with the Northern Indiana Power Company. An order permitting the Public Service Company to buy the Suburban Electric Service Company has also been issued.

With the merging of the Indiana Electric into the Public Service company a single corporation will be formed which will serve 216 cities and towns in central and southern Indiana. The second merger will form a corporation to serve 183 cities and towns in western and northern sections of the state. Officials of the companies testified at recent hearings on the merger proposal that the amalgamation would result in improved service to patrons.

N. E. M. A. Makes Plans for $200,000,000 Market Development

DISCUSSION and general acceptance of the so-called $200,000,000 plan for market development will be the outstanding feature of the National Electrical Manufacturers' Association's winter meeting to be held at its headquarters and at the Hotel Biltmore on January 12. The proposed sale of a million electric ranges during the next three years is to be discussed. The distribution of this number of ranges will involve the demand for allied electrical and other apparatus and supplies to a total of $200,000,000. The plan as set forth has the wholehearted support of all members of the association to whom it has been presented. President Trumbull says:

"In arranging for the feature and keynote of the January meeting of the National Electrical Manufacturers' Association we are most fortunate in having an industry plan of market development of a unique and outstanding character. When adopted it will emphasize the leadership of N.E.M.A. in a new and striking way. N.E.M.A. will show itself capable of co-ordinated market promotion, of developing a united will and an organization consciousness, in spite of its many separate and diverse units of organization. It will show a new form of enlightened selfishness. It will start a movement not limited to itself, but stimulating and profiting the entire electrical industry."

Mr. Berresford, managing director of the association, states:

"The $200,000,000 plan for the popularization of electric cookery which was born of that discussion, and which has been developed to the point where it will be the outstanding feature of the coming meeting in January, adopts the electric range as that item. And it adopted it with reason. No other appliance affects so directly and materially so many lines of electrical manufacture. The presentation should be of absorbing interest to every N.E.M.A. member producing merchandise material and products.

"Is the plan workable and will N.E.M.A. members adopt it? An unqualified affirmative to the first question seems indicated and it would be difficult to understand any other answer to the second. If it is given—and I confidently believe it will be—N.E.M.A. enters unitedly on a new sphere of usefulness and a field of opportunity to which there are no visible limits."

Coming Meetings

American Engineering Council—Washington, Jan. 14-16. L. W. Wallace, 744 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, Jan. 25-29; district meeting, Milwaukee, March 14-16. F. R. Hutchinson, 33 West 39th St., New York.

Conference of Electrical Leagues—Philadelphia, Jan. 25-27. Society for Electrical Development, 420 Lexington Ave., New York.

North Central Electric Association—Commercial Section, Lowry Hotel, St. Paul, Jan. 29 and 30; Engineering Section, St. Paul Hotel, St. Paul, Feb. 22 and 23. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electric Light Association—Group committee meetings: Engineering National Section, New York, Feb. 1-5; Accounting National Section, Statler Hotel, St. Louis, Feb. 15-17. A. J. Marshall, 420 Lexington Ave., New York.

Oklahoma Utilities Association—Tulsa, Okla., March 8 and 9. E. F. McKay, 1020 Petroleum Bldg., Oklahoma City.

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No Change for Bremerton, Wash.

At a recent city election in Bremerton, Wash., the Puget Sound Power & Light Company received a ten-year renewal of its franchise to furnish light and power. The alternative proposal was to buy power from the Tacoma municipal power system. The vote was 1,808 to 1,255.

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HOW LOGAN FIELD, BALTIMORE'S TEMPORARY MUNICIPAL AIRPORT, IS LIGHTED

Courtesy Consol. Gen. Elec. Light & Power Co.

Seven Crouse-Hinds type DCE-24 floodlamps are installed in one location, using 3,000-watt, 32-volt bulbs. Projectors are 10 ft. above the ground. Back of the projectors are quarters for the field custodian which contain a 25-kva., 460/32-volt transformer and a remote-control switchboard. The obstruction light on the very top is 40 ft. above the ground.

Wisconsin Utilities Must Pay Investigation Costs

The Wisconsin Senate on December 22 engrossed the Loomis bill, which assesses without exemption against public utilities that are investigated part of the costs of investigation by the Public Service Commission. The vote was 16 to 15, Lieutenant-Governor Henry Huber casting the deciding vote. Passage of the bill in the Assembly is believed certain.

The measure is intended to meet the constitutional objection raised in the Dane County Circuit Court against the 1931 regulatory law which permitted the commission to use discretion in assessing investigation costs against the utilites. By the terms of this statute the commission could exempt utilities from investigation costs if nothing was found wrong. The Wisconsin Telephone Company challenged the law, and the courts found that particular provision invalid because it delegated legislative powers to the commission.

At the special session of the Legislature which is now meeting Senator O. S. Loomis offered a bill which provided that the commission could collect 5 per cent of the gross receipts of utilities in investigations costing as much as $11,000,000. So much opposition developed to this proposal that he offered a substitute which provided that a reasonable percentage of the costs should be assessed. The substitute was adopted, and a motion made to kill the bill as amended failed by 16 to 15, President Huber voting against it.

Senator George Blanchard asserted that the bill permits the commission to spend $11,000,000 or more in investigations. Senator Loomis replied that only reasonable costs would be permissible and that the courts would not sustain unreasonable ones.

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Washington Court Upholds Anti-Submetering Rule

After long litigation the submetering of electrical energy in Washington, D. C., has been finally prohibited by court decree. The Supreme Court of the District of Columbia on December 23 upheld a regulation confirmed by the Utilities Commission which forbids the resale of electric service. Originally it was found that 42 buildings were purchasing energy at wholesale rates from the Potomac Electric Power Company, the defendant in the suit, and were reselling it to their tenants on a measured basis.

Preliminary attempts on the part of the commission to stop submetering met with favor. The Potomac Electric Power Company then revised the conditions pertaining to its service so as to require customers to abstain from the practice, the Public Utilities Commission approving. The order was opposed in a test case by one of the wholesale users of electricity, and this consumer is now expected to take the case to the District Court of Appeals. In its finding the District Supreme Court makes in effect the following observations:

The regulation of the defendant designed to prevent submetering and which limits the purchase of electrical energy to the customer's own use is lawful, reasonable and non-discriminatory. . . . To permit any device whereby electricity is not sold by the defendant to the ultimate consumer at rates which are under governmental regulation and just and reasonable, but is sold to a middleman at rates which may or may not apply to the ultimate consumer, will affect the net revenue of the defendant and will be against the public interest and good public policy. . . .

There is no discrimination by the defendant in selling its electricity to one who rents electrically serviced space and refusing to sell energy to one who intends to sell the same to his tenants on a measured or unmeasured basis. . . . The defendant power company is entitled to discontinue its service to the plaintiff unless the plaintiff will agree that electric service furnished shall be for his own use and is not to be remetered or submetered for the purpose of selling to others.

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HARD-SURFACING WITH THE CARBON ARC

—Courtesy Lincoln Electric Company

Equivalent in effect to case-hardening but producing a surface much more resistant to abrasion is the process of depositing granular tungsten carbide on wearing surfaces with the carbon arc. The operator is giving an airplane skid shoe an increased abrasion resistance.

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Weekly Energy Output

Weekly energy output by central stations for light and power, as reported by the National Electric Light Association, is shown in millions of kilowatt-hours in the following table:

	1931	1930	1929	1928
November 21.....	1,655	1,722	1,818	1,701
November 28.....	1,600	1,672	1,718	1,619
December 5.....	1,671	1,747	1,806	1,706
December 12.....	1,672	1,748	1,841	1,716
December 19.....	1,676	1,770	1,860	1,710
December 26.....	1,565	1,617	1,638	1,527

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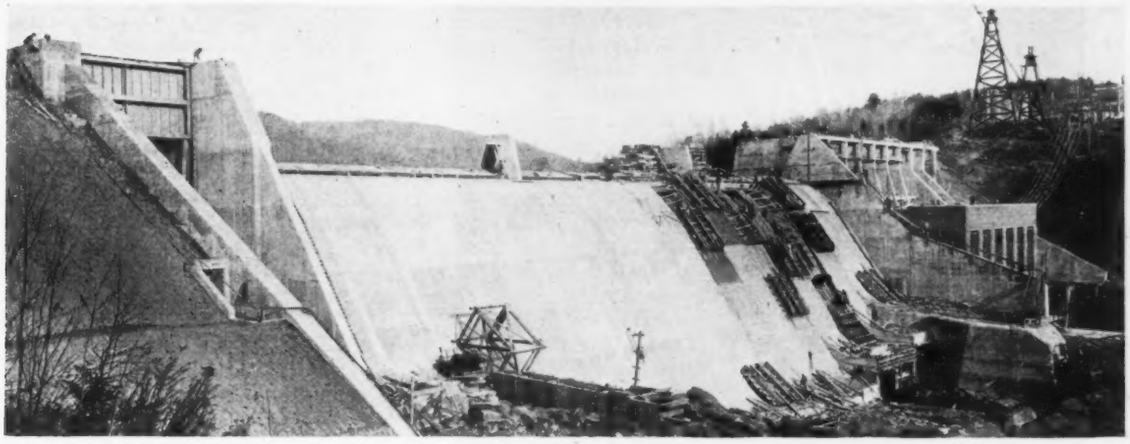
Power-Line Insulator Committee Approved

The personnel of the technical committee on insulators designed for electric power lines, which will function under the procedure of the American Standards Association, has been approved by the new electrical standards committee. The personnel was submitted to this committee for approval by the American

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE INCREASES HYDRO RATING



When the Ayer's Island station was built on the Pemigewasset River in 1924 provision was made for raising the dam from 50 ft. to 80 ft. and replacing three 2,500-hp. by three 4,404-hp. wheels. Changes will have been completed early in 1932.

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Institute of Electrical Engineers and the National Electrical Manufacturers' Association, sponsors for the project. The personnel as approved by the electrical standards committee follows:

K. A. Hawley, H. E. Bachman, F. W. Peek, C. L. Fortescue, R. E. Argensinger, F. M. Farmer, H. B. Dwight, G. I. Wright, G. W. Chappell, W. H. Burleson, E. H. Fritz, G. W. Lapp, W. L. Stinson, H. B. Vincent, J. A. Brundige, H. S. Phelps, W. G. Kelley, R. R. Cowles, J. Allen Johnson, T. H. Haines, Arthur Halsted and J. T. Littleton; alternates, E. H. Rowland, A. B. Campbell and P. H. Bates.

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Crisp County Plant Leads to Local Dissension

Diversity of opinion exists among authorities and citizens of Crisp County, Ga., site of the famous county-owned hydro-electric plant which has furnished many news items, regarding what should now be done with it. Worried, it is reported, by a default in payment of taxes assessed to meet interest and installments on bonds and by the lack of sufficient sums in the county treasury to take care of these obligations, the Crisp County Power Commission met recently and unanimously resolved to offer the plant for sale to the Georgia Power Company—the competitor with which an interesting rate fight was recently waged—ratification of any agreement reached to be dependent on a vote of the people of the county.

A committee which had been appointed to broach the subject to the power company had reported, the commission said in its resolution, that the company was willing to purchase the plant at cost provided that the distribution system was included at a price mutually agreed upon, and the commission instructed this committee to continue negotiations to bring such an arrangement about. On this was probably based the report first made public, and noted in the ELECTRICAL WORLD last week, that offers had been received from the company but were not being seriously considered by the commission.

The text of the commission's resolution proves that it is entirely serious in seeking to get the plant off its hands. According to the Cordele *Dispatch*, however, its efforts "were disapproved and the commissioners severely criticised" at a recent meeting of Cordele citizens. "Sentiment here is strongly against the action of the commissioners," the local paper continues. "The dam will continue under county ownership and all obligations will be met without difficulty. It is alleged that the resolution of the commissioners was a self-defense move, and it is known that it does not constitute the sentiment of Crisp County citizens. The citizens are more nearly unanimous now in their indorsement of the project than at any time heretofore."

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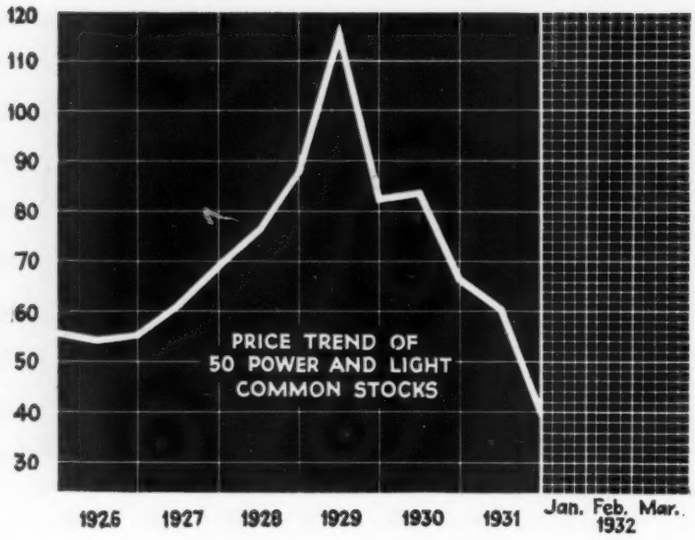
Utility Makes Ultra-Violet-Ray Test of Efficiency

Ultra-violet-ray lamps have been placed in the billing department of the Philadelphia Company, Pittsburgh, to test their effect on 50 girl workers in order to demonstrate whether or not the rays will improve the health of the girls and as a corollary increase their efficiency. The test has been going on since October 1 and will be continued for two months more.

Brief History of the "Electrical World"

The *Electrical World* (published under that name since 1883 and tracing its history back to 1874) is a consolidation of the *Electrical Engineer* (founded in 1882 as the *Electrician*) and the *American Electrician* (founded in 1896). Final consolidation under the title of *Electrical World* took effect on January 1, 1906, the *Electrical World* and the *Electrical Engineer* having been acquired by the McGraw Publishing Company in 1899 and amalgamated as the *Electrical World and Engineer*, and the *American Electrician*, a McGraw monthly, having been absorbed seven years later.

The roster of past editors of the *Electrical World* includes Carl Hering, Louis Bell, W. D. Weaver, T. C. Martin and many other men prominent in the electrical industry —some, like those named, no longer living, and others, like W. H. Onken, Jr., C. O. Mailloux, A. S. McAllister, Frank F. Fowle, F. M. Feiker, D. H. Braymer and H. V. Bozell, still active in engineering and industrial service. L. W. W. Morrow is now editor. Allen M. Perry is managing editor. Other members of the present staff are: Earl Whitehorne, contributing editor; G. F. Wittig, statistical editor; H. M. Cameron and A. E. Knowlton, associate editors; F. C. Wells, news editor; E. R. Searles and E. M. Glennon, assistant editors; F. R. Innes, Western editor; H. S. Knowlton, New England editor; Walter C. Heston, Pacific Coast editor, and Paul Wooton, Washington correspondent.



Have We Reached Bottom?

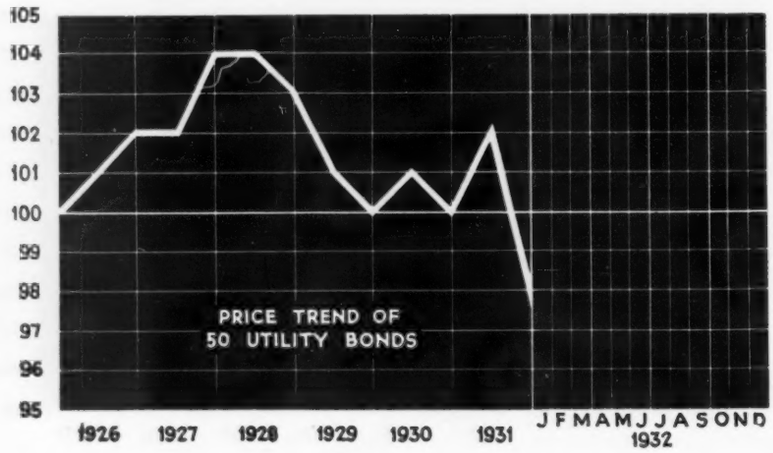
HAS the 27-month slide of market prices brought us to the bottom of the hill? Plenty of market analysts can be found to assure us it has. They are more in agreement in this, in fact, than at any time in two years.

If utility stocks alone constituted the market there would be no argument. It would be obvious enough that we have foolishly sold them far below their value. Their gross earnings declined about 1 per cent and we sold them down 75 per cent in many cases.

But foreign and domestic financial difficulties have not all been solved. Investor fear is still dominant. The nation's banking situation is not out of danger. And the influence of all these factors, determining the trend of the market in general, must be considered in the utility stock outlook.

There are favorable factors, of course, but justification for a sudden definite upturn in quotations is still lacking.

With utility bonds the situation is a little different. Definite banker support seems to have appeared. The prospect of tangible benefits from the Reconstruction Finance Corporation is an important influence. Investor fear is disappearing rather definitely. High-grade utility bonds have been highly favored in recent trading sessions.



Utility Plans Reduction of Capitalization

Plans are being made by the American Commonwealths Power Corporation to revise the stated capitalization in the form of common stock. A special meeting of class B common-stock holders was to be held at Wilmington, Del., December 31 to vote on the proposal to change the stated value of class A and B shares from $10 to $5. Frank T. Hulswit, president of the company, stated his opinion that the class B common-stock holders who have the voting rights of the organization would ratify the change and over $10,000,000 would be added to surplus account, bringing the total surplus up to around $15,000,000. Such a change, of course, would in no way affect the intrinsic value either of class A or B common stock, nor the relative position of the two classes.

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Bond & Share Group Plans Little New Construction

No major construction is contemplated for 1932 by companies affiliated with the Electric Bond & Share Company, according to information given out this week. Generating stations and transmission lines built in recent years will fulfill all requirements for several years to come, and individual systems have been fully interconnected. Distribution systems needed to supply new customers will comprise the only construction work of any account.

This latter work, it is announced, will be financed through the sale of preferred stock to customers. Electric Bond & Share groups have been particularly successful in this type of financing in the past, and it is understood that ample capital can be secured readily in this way.

The affiliates of the Electric Bond & Share Company are well situated from a capital standpoint at the present time. The only electric company under the supervision of Electric Bond & Share which owes money to banks at the present time is the American & Foreign Power Company, Inc., which has bank loans of $50,000,000 due next October. It is stated that no plans have been formulated to date for the retirement of these obligations, since it is too early to predict the condition of the securities market between now and then.

The refinancing program of Electric Bond & Share Company and affiliates for 1932 concerns principally operating companies. Total maturities are only $13,560,000. It is understood that a portion of the maturities of the group will be financed by the sale of underlying securities, especially those of companies whose obligations mature, and the balance will be financed out of earnings.

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Stockholders Sue for Accounting and Damages

Suit against the American Light & Traction Company, 26 of its present and former directors, United Light & Power Company, the Koppers Company and a number of affiliates has been instituted by two stockholders to compel an accounting and payment of damages. It is charged that the Eaton and Koppers

interests, through their control of the directors of the American Light & Traction Company, directed stock transactions resulting in profits to themselves and losses to American Light & Traction of over $19,500,000.

The suit was filed in Chancery Court, Newark, N. J., by Waldron M. Ward of Newark & Wall, Haight, Carey & Hartpence of Jersey City on behalf of Harry Helfman of Detroit, owner of 5,700 shares of common stock, and Stockton Crammer of Somerville, N. J., owner of ten shares. Vice-Chancellor John H. Backes signed an order temporarily restraining directors from transferring their holdings in the company pending the return of the order to show cause by January 5 why the restraint should not be continued until the suit is heard. He appointed Russell Fleming of Newark to sequester any real or personal property which the directors may have in New Jersey.

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Companies Reduce Capital

Two subsidiaries of the Niagara Hudson Power Corporation have decided to reduce their capital stock. The Niagara, Lockport & Ontario Power Company has filed a certificate of reduction of its capital stock from 827,500 shares to 327,500 shares, no par. Niagara Falls Power Company has reduced its share capital from 1,600,000 to 800,000 shares.

The stated value of the stock of the General Public Service Corporation has been reduced to $1 a share by a vote of stockholders. This will increase capital surplus by about $8,000,000.

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Recent Listings

The New York Stock Exchange has approved the application of the American Power & Light Company that there be substituted on the list on or after January 2 certificates for 1,004,846 shares of $5 preferred stock on official notice of issuance, in lieu of the presently listed 1,004,846 shares of the $5 preferred stock, series A, and $5 preferred stock, series A, stamped, of the company. On January 1, 1932, all $5 preferred stock, series A, shall become $5 preferred stock.

There have also been authorized for listing on the big board additional first mortgage gold bonds, 4½ per cent series due 1961, of the Kansas City Power & Light Company, amounting to $3,000,000 upon official notice of sale and distribution, making the total amount applied for $30,000,000.

For the preferred shares and class A common shares, each without par value, now on the Boston Stock Exchange list there have been substituted 220,000 shares, without par value, of $7 cumulative preferred stock of the Standard Power & Light Corporation, 110,000 shares, without par value, common stock, and 110,000 shares without par value, of common stock, series B.

The Boston Stock Exchange has authorized listing of secured serial gold notes, 5½ per cent, of the New England Power Association, to be dated February 15, 1931, to the amount of $3,600,000, and to be due serially $360,000 each from 1932 to 1941, both inclusive.

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The number of stockholders in the Public Service Corporation of New Jersey has reached a new high record. On October 31 the total was 89,819. The previous high record of 87,196 was established on September 30, 1931. Stockholders of the company have shown a steady increase in recent years. In the last five years alone the number has more than doubled.

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In announcing the decision of the Winnipeg Electric Company to defer dividend payments on the 7 per cent cumulative preferred stock for the current quarter, the president, Edward Anderson, said: "Among the reasons actuating the directors in making this decision were the following: Factors causing a marked falling off in the net revenues, namely, a shortage of water, curtailing production and sale of power; declining traffic on the street railway and excessive taxation of the street railway properties."

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An amendment to the charter of the Montreal Light, Heat & Power Company, granting it permission to reduce its par value stock from $100 a share to $50, was adopted by the Quebec Legislature December 4.

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Directors of the Central Maine Power Company recently declared an annual dividend of 4 per cent on the common stock, par $100, payable December 1. A year ago an annual payment of 5 per cent was made.

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Light and Power Issues in December Total $17,000,000

DECEMBER brought the year to a close with the smallest monthly total for electric light and power financing recorded during the year with the exception of October, when no new offerings appeared. Declining bond prices and an unreceptive market made it virtually impossible to market any issues except those of operating companies in high credit standing. New issues amounted to the unsubstantial sum of $17,000,000, as compared with $26,484,000 in November and $47,423,500 in December, 1930. The average yield receded from 6.26 per cent in November to 5.66 per cent.

New Security Issues of Electric Light and Power Companies in December

Name of Company	Amount of Issue (Par Value)	Period (Years)	Class	Purpose	Interest Rate	Price	Per Cent Yield
Central Maine Power Co.	$1,500,000	30	First and general mortgage gold bonds, series F	To reimburse for expenditures made in construction of additions to plants and properties	5½	99	5.57
Super-Power Co. of Illinois	2,500,000	30	First mortgage gold bonds	Additions	6	91	6.70
Kansas City Power & Light Co.	3,000,000	30	First mortgage gold bonds	To reimburse for funds heretofore expended for additions to property and for other corporate purposes	4½	96	4.75
Central Power & Light Co.	1,000,000	20	First mortgage gold bonds, series B		6½	90	7.47
San Diego Consolidated Gas & Electric Co.	1,500,000	1	Gold notes	To retire maturing notes	4½	99	5.54
North Boston Lighting Properties	7,500,000	1	Secured gold notes	To retire maturing notes, reduce current bank indebtedness and for other corporate purposes	5½	100	5.50
Total	$17,000,000			Rights			
Total amount actually realized	16,525,000			Total financing...$16,525,000			

Revenues Rise, but Are Under 1930; Net Holds Up

NOVEMBER returns for operations of electric light and power companies thus far received by the ELECTRICAL WORLD indicate that the revenue rose seasonally compared with October, but was somewhat less than in November of 1930, the changes in per cent being respectively 1.9 and 2.9 Based on the $187,340,000 a year ago, final returns are expected to show a gross approximating $182,000,000. Meanwhile operating expenses continue to be smaller than in 1930, so that net continues very close to the level of the preceding year.

Fuller returns for October show a total for the industry differing but slightly from the estimate announced several weeks ago: $178,630,000 in 1931 against $182,950,000 in 1930, a decline of 2.36 per cent. Operating expenses, exclusive of taxes, interest and amortization charges, fell from $81,640,000 to $76,810,000, resulting in a rise of 0.5 per cent in net. The increase was probably swallowed by higher taxes; although monthly data on this item are not available, the upward trend of taxation is unfortunately too well known to call for comment here.

Comparative figures through October are given in the accompanying tables. These show that while revenue has for some months been falling below that of 1930, the difference has been small, and has been balanced by reductions in operating expenses. The latter reductions are in a measure accounted for by the smaller output. Energy generation from water power is decidedly less than normal, largely because of the low stream flow during the past two years.

Regional statistics for October (Table III) reflect the country-wide nature of the decrease in revenue; New England alone reported a gain, but it was smaller than in September—0.3 per cent against 2.6 per cent.

Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1931 Thousands	1930 Thousands	Per Cent Inc.	1931 Thousands	1930 Thousands	Per Cent Inc.
July	167,190	166,200	+0.6	75,170	77,500	—3.0
August	167,380	168,100	—0.4	75,590	78,300	—3.5
September	171,930	174,940	—1.7	75,300	78,800	—4.4
October	178,630	182,950	—2.4	76,810	81,640	—5.9

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Table II—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1931	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
July	7,259,767	—1.3	2,508,327	—4.1	4,751,440	+0.2	1,956,000	+ 4.7
August	7,158,675	—3.0	2,260,966	+0.2	4,897,709	—4.4	2,025,000	+ 1.5
September	7,084,895	—3.1	2,005,600	—2.6	5,079,295	—3.3	1,963,000	— 0.2
October	7,290,689	—5.4	1,895,769	—9.2	5,394,920	—4.0	2,020,000	— 4.3

Table III—Regional Operations, Revenue and Energy Output in October, 1931

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	178,630	—1.7	7,290,689	— 5.4	1,895,769	— 9.2	5,394,920	— 4.0
New England	18,420	+0.3	501,444	— 5.1	183,770	+63.6	317,674	—23.6
Middle Atlantic	46,050	—1.4	1,874,785	— 3.6	385,695	+11.7	1,489,090	— 6.9
East North Central	41,520	—6.3	1,660,568	—10.0	148,449	+20.4	1,512,119	—12.3
West North Central	14,970	—2.3	488,282	— 1.9	99,574	+ 1.6	388,708	— 2.7
South Atlantic	19,350	—0.1	869,693	+ 1.4	247,386	+ 7.5	622,307	— 0.7
East South Central	6,350	—2.7	260,456	—17.4	157,155	—28.2	103,301	+ 7.1
West South Central	11,030	—1.6	410,166	— 3.6	3,994	—22.2	406,172	— 3.4
Mountain	4,330	—4.8	235,618	—18.6	169,918	—24.3	65,700	+ 1.3
Pacific	16,610	—0.8	989,677	— 1.6	499,828	—31.6	489,849	+78.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

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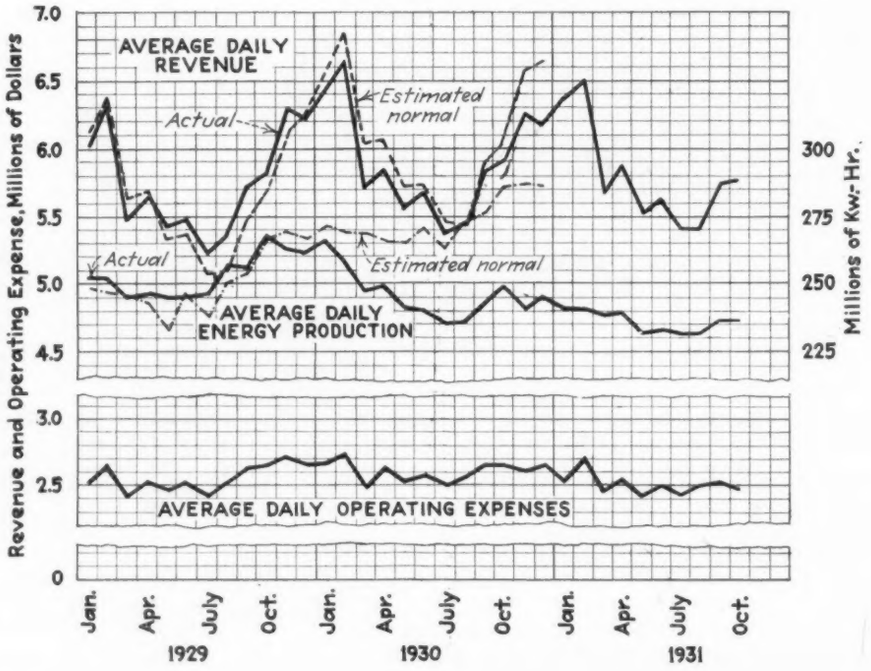
Copper Producers Seek 4-Cent Protection

High-cost domestic producers of copper expect to make capital in their campaign for tariff protection out of the Tariff Commission's report to Congress this week. They are keenly disappointed, however, with the commission's finding that average domestic cost is only 1.42 cents a pound higher than average foreign cost. They claim that as it is the high-cost mines that will be forced to



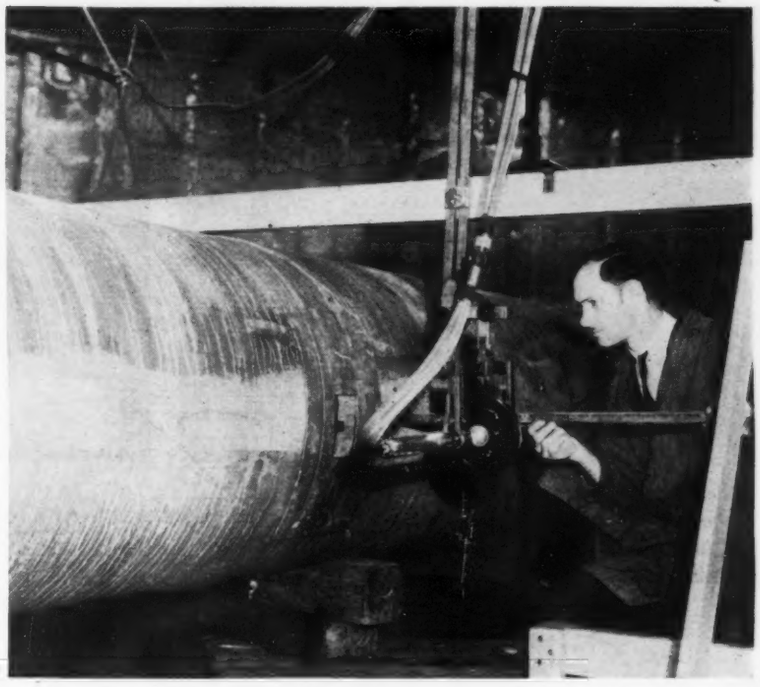
shut down if protection is not afforded, the commission should have taken the costs of such mines in computing the differential in favor of their foreign competitors. A 4-cent duty is the goal of high-cost operators.

The commission's cost calculations are based on 1928 as the most representative year among the three covered by its investigation. Advocates of a tariff will find support for their cause in the commission's statement that if present conditions in the industry were taken into consideration and prospective low-cost operations in Africa and Canada could be anticipated, the cost differential against the United States would be much greater. The commission reported, however, that it is impossible to estimate with any precision the future costs of production in Africa.

New York Metal Prices

	Dec. 23, 1931 Cents Per Pound	Dec. 30, 1931 Cents Per Pound
Copper, electrolytic..	7.25	7.25
Lead, Am. S. & R. price	3.75	3.75
Antimony.....	6.25	6.25
Nickel, ingot.....	35	35
Zinc, spots.....	3.50	3.475
Tin, Straits.....	22	21.70
Aluminum, 99 per cent.	23.30	23.30

X-RAY EXAMINES MATERIAL FOR MERCURY UNIT



The new X-ray laboratory of the General Electric plant at Schenectady is set to work probing into the metal parts for the new mercury-turbine power station soon to be built there. The illustration shows the X-ray tube being set up for a photograph through 4 in. of metal.

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England Using Electricity for Generation of Steam

Electrically heated steam boilers have recently been completed by A. Reyrolle & Company, Ltd., Hebburn-on-Tyne, England, for a steam laundry in that country. Each boiler is designed to supply 360 lb. of steam per hour at a pressure of 60 lb. per square inch and is suitable for direct connection to a three-phase, 400-volt, 50-cycle electric power supply. The shells of the boilers are of the Cochran type, with a number of horizontal tubes into which are fitted 48 tubular immersion heaters with a total loading capacity of 150 kw. Three sections, each with sixteen heaters, are connected to three separate sets of busbars.

In the course of a test the shells were filled with water to half gage glass, the temperature of the water being 82 deg. F. The full load of 150 kw. was applied, and a steam pressure of 60 lb. was attained in 50 minutes. During a steaming test for one hour approximately 40 gal. of water was evaporated, representing an output of 400 lb. per hour. The tests were made with the shells unlagged, and an increased output is therefore to be expected. The makers have also prepared designs for electrically heated boiler installations of 15-, 30-, 40- and 80-kw. capacity.

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CURRENT EARNINGS REPORTS OF ELECTRIC LIGHT AND POWER COMPANIES

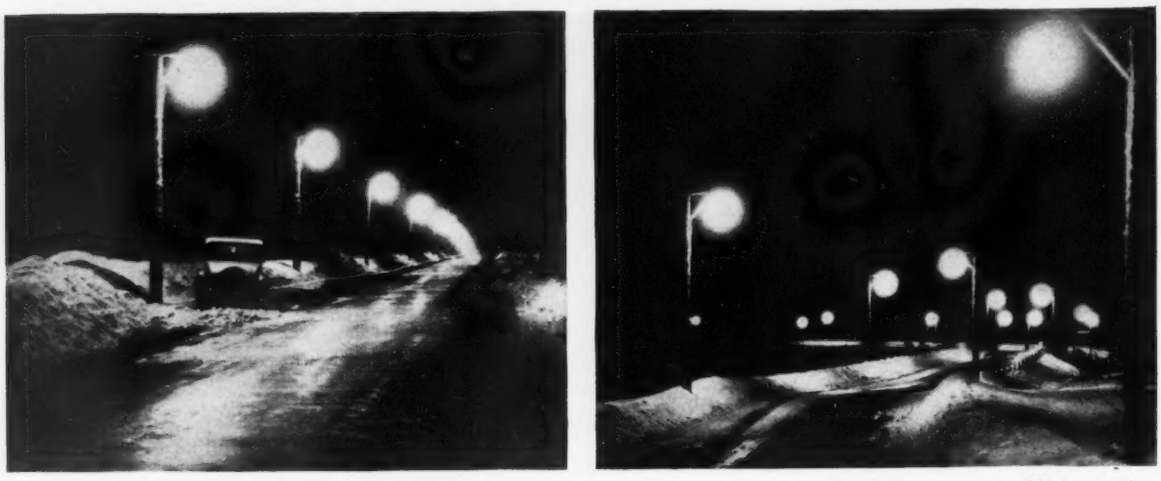
OPERATING COMPANIES

	1931	1930	Per Cent Increase	Operating Ratio 1931	Operating Ratio 1930
Birmingham Electric (Year ended October 31)					
Gross earnings	$7,499,977	$8,419,922	—11.0	69	70
Net earnings	2,321,295	2,612,937	—11.0	..	..
Carolina Power & Light (Year ended October 31)					
Gross earnings	9,654,195	8,949,747	8.0	49	44
Net earnings	4,940,901	4,998,507	— 1.0	..	..
Houston Lighting & Power (Year ended October 31)					
Gross earnings	8,537,188	8,798,005	— 3.0	47	52
Net earnings	4,549,421	4,223,657	8.0	..	..
Memphis Power & Light (Year ended October 31)					
Gross earnings	7,007,110	6,739,530	4.0	58	59
Net earnings	2,909,132	2,759,662	5.0	..	..
Montana Power (Year ended October 31)					
Gross earnings	8,841,378	10,616,708	—17.0	41	39
Net earnings	5,261,114	6,510,017	—19.0	..	..
Northwestern Electric (Year ended October 31)					
Gross earnings	3,596,606	3,721,439	— 3.0	58	60
Net earnings	1,519,859	1,510,389	1.0	..	..
Pacific Power & Light (Year ended October 31)					
Gross earnings	4,707,384	4,439,113	6.0	52	51
Net earnings	2,235,684	2,182,111	2.0	..	..
Pennsylvania Power & Light (Year ended October 31)					
Gross earnings	$34,434,853	$30,880,068	12.0	49	49
Net earnings	17,614,614	15,692,631	12.0	..	..
Southern California Edison (11 mos. ended November 30)					
Gross earnings	37,504,885	37,798,911	— 0.8	..	..
Net earnings	24,797,773	25,587,761	— 3.1	..	..
Texas Electric Service (Year ended October 31)					
Gross earnings	8,449,778	9,212,410	— 8.0	49	48
Net earings	4,347,124	4,795,540	— 9.0	..	..
Texas Power & Light (Year ended October 31)					
Gross earnings	9,951,108	9,966,601	— 0.0	48	48
Net earnings	5,170,296	5,136,355	1.0	..	..
Washington Water Power (Year ended October 31)					
Gross earnings	8,996,184	9,466,823	— 5.0	47	44
Net earnings	4,818,525	5,326,789	—10.0	..	..

HOLDING COMPANIES

American & Foreign Power & subs. (Year ended September 30)					
Gross earnings	$69,458,189	$77,351,407	—10.2	49	50
Net earnings	35,428,605	38,606,501	— 8.2	..	..

NEW YORK EXTENDS ITS RURAL HIGHWAY LIGHTING PROGRAM



For several years experimental installations have been made in upper New York State to establish good rural road-lighting practices. Permanent work following the information developed is now under way. Old Forge (left) and Raquette Lake, in the Adirondack district of New York, afford good examples of modern highway lighting, 400-cp. General Electric "Novalux" units, mounted on rustic 17-ft. poles quite closely spaced, illuminating well-frequented roads.

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Selling Electric Furnaces on a Rental Basis

In these days of firm determination on the part of industrial management to hold down capital expenditure as much as possible the selling of plant equipment, which includes electric furnaces, is a tough job. The Hevi Duty Electric Company of Milwaukee, Wis., manufacturer of electric heat-treating furnaces, appears to have got around this difficulty by a plan in which selling does not enter at all, but which consists actually of a rental agreement in which not even the time element of a lease appears, for the agreement can be terminated by either party at any time. The plan has not been in effect long enough yet to have yielded sufficient definite results on which to state unqualifiedly that it is successful, but, judging from the interest indicated by inquiries following the first advertising announcement, it is believed that the objective, which is the reduction of a type of sales resistance peculiar to this depression period, will be definitely attained.

It was concluded that the only feasible scheme was to install equipment on a rental basis wherein the customer was not committed to buy, but wherein after a certain number of rentals were paid the title of the equipment would be transferred to him. There were two essential fundamentals in regard to the equipment itself that had to be fulfilled before any such scheme could become practical. The saving that the customer could obtain over his present operating cost must be greater than the amount of the monthly rental. The equipment, in case its use was discontinued by the customer for any reason, must find ready placement in another installation, preferably in the same locality. Among the types of furnaces built by the Hevi Duty Electric Company there was one that fitted these requirements remarkably well. This was the vertical carburizing furnace using the "Carbonol" process.

The plan was therefore worked out along these specific lines: The customer is under no obligation to buy the equipment. He signs a form of lease in which he agrees to make fifteen equal monthly payments or at any time during the agreement may return the apparatus to the company. The customer further has the privilege at any time during the agreement of acquiring title to the equipment by the payment of a certain percentage of the unexpired rentals, this alternative usually arising from the customer's desire to save the carrying charges which necessarily have been applied to the rentals in excess of the usual selling price of the furnace.

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German General Electric Announces Loss

According to announcement made at a board meeting just held, the German General Electric Company ended the business year which closed September 30 with a loss. The total turnover amounted to 370,000,000 marks, compared with 520,000,000 marks in 1930. Home business, it was stated, was still declining while exports were hindered severely by the new customs barriers. The company's financial position, however, was satisfactory, its sterling obligations being fully covered by the company's outstanding debts. The confused conditions at home and abroad prevented any forecast as to the near future. The dividend for 1930 was 7 per cent.

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Changes in Marking of Armored Cable

Contractors, jobbers and electrical inspectors will be interested in changes in Underwriters' Laboratories' requirements for the marking of armored cable.

It has always been required that armored cable be provided with a distinctive marking its entire length so that the product may be identified as to its maker. The means of identification has been either a letter or symbol indented or embossed in the convolutions of the armor at frequent intervals, or a marker thread or threads between the armor and the cabled conductors. The thread marker is no longer recognized, and all manufacturers of armored cable are now required to make the identification of their product possible by a mark in the armor. The marks used by the various manufacturers are to be described in Underwriters' Laboratories' list of inspected electrical appliances.

Another new marking requirement pertains to leaded-type armored cable (type ACL). This material will be marked not only for identification of manufacturer but also in a way to indicate that it is of the leaded type. This will be accomplished by having the word "lead " or "leaded" embossed or indented in the armor.

EDITORIALS

L.W.W.MORROW
Editor

My message to you is to be courageous. I have lived a long time. I have seen history repeat itself again and again. I have seen many depressions in business. Always America has come out strong and more prosperous. Be as brave as your fathers were before you. Have faith — go forward.—THOMAS A. EDISON.

Shirtsleeves must replace stuffed shirts

AS THE electrical industry studies prospects for 1932 it finds that business depends very largely upon its own efforts. It can rest until the normal business already developed comes back in volume or it can go to work and develop new business in volume. This new business exists in every market that now uses electrical products and services. But it can be had only by making objectives definite for each electrical enterprise and then going after the business. In this sense the business improvement is identical with definite acts to sell something or to save something.

The "style" element in mass psychology is illustrated by the great popularity of the home market. Unanimous agreement prevails that here is an opportunity. Yet when one gets down to brass tacks what is being done to develop the business? Ranges are to be sold in volume, the refrigerator campaign is to be continued, and more dabbling will be done with water heating and air conditioning. But the same cumbersome distribution set-up exists, the same ineffective and unprofitable scale for sales margins exists, and the same cut-throat competition exists. No one has a plan for the economical sale of multiple products and service to the homes whereby promoters of sales outlets will become prosperous and an industry-wide attack will be made on the market. Unbalanced attention to the refrigerator in 1931 brought the usual inattention to other appliances, and the final result of the year's work was the usual small increment in the total home market development. In the home market as in other markets results will be had by shirtsleeve leadership that recognizes the place of individualism and the place of co-operation in practical merchandising.

Next to recklessness at the top of a boom the most foolish thing in the world is discouragement at the bottom of a slump.

ROGER W. BABSON,
Statistical Economist.

But the home market is not the only business opportunity, as some believe. There are both a power and an electric heat business in the industrial field each as large as the present market. All industry is not prostrate; all possible electrical power and equipment has not been sold to industry. The electric bill of industry in 1929 was less than one-fifth its fuel bill for producing its own heat and power. With present values for equipment and power, how much of the unserved business can be taken over? In 1929 the average rate paid for power by industry was 1.31 cents per kilowatt-hour. As 1931 closes many localities exist where utilities can compete for unserved power busi-

ness profitably at a rate of about 6 mills—that is, if they will put in modern generating plants. Surely the time is ripe for each utility to look over its unsaturated power market and see what can be done to get business.

But why stop with two large markets? Just a few words convey business opportunities in many fields to the informed: architectural lighting, floodlighting, built-in lighting, gaseous lighting, air conditioning, railroad electrification, highway built-in lighting, city lighting as contrasted with street lighting in cities, health apparatus, new chemical processes, welded buildings, electric heat and electric signs. New ideas and old ideas exist in volume. The markets are receptive. Business for the electrical industry in 1932 will be just what each enterprise and the industry as a whole make it by action.

To regard present conditions as permanent and then to legislate as if they were is a serious mistake. I grant that this so-called regulation would stabilize something—it would stabilize pretty nearly every wrong condition that we want to be rid of.

HENRY FORD

In the political pot

THE electric pot has been boiling, but it has not boiled over during the year. Muscle Shoals is still an unsolved problem, but St. Lawrence has superseded it for a while in the headlines. Arizona remains unreconciled to Hoover Dam. To add to the gayety, Canada's Beauharnois project got into the limelight of politics; the project is, however, proceeding rapidly to its stupendous conclusion. The Federal Power Commission sits uneasy, awaiting final confirmation of the tenure of its chairman, meanwhile making a bid for grandiose bureaucratic expansion. The Federal Trade Commission has had Commonwealth & Southern, New England Power, Byllesby and Insull groups on the griddle. Those proceedings, however, are dwindling into an ever-with-us sort of tolerance.

On the whole, the "power issue" is shriveling in spite of the valiant efforts of public ownership advocates to keep it robust. Their drive has more recently shifted toward punishing the mythical "power barons" by putting government into active competition. Municipal ventures are being encouraged in some areas, but in others there has been the counter-effect of putting them on a par with those privately owned as to accounting and taxation. Harassing in Pennsylvania and other states brought out the usual tirades and vilification of the good intentions of the power industry. Two states legislated utility merchandising into the category of a misdemeanor.

Regulation has changed complexion a bit. New York and Kansas have commissioners who represent a new school of negotiation for prompt action, bent on the invigoration of regulation activity generally. Valuation is subsiding into the background, and rate cases have been comparatively few because voluntary reductions have continued to be numerous. Commissions have been digging deeper to find the sore spots in public relations, the motive being to disprove the unsound assertion that regulation is ineffective. Distribution costs have come in for their just share of attention—the holding company likewise, but it remains in the borderland between state and federal governments. Interstate transmission is not so much of a crime as it was made out to be when its existence was discovered by the "progressives."

Let us face the present unpleasant facts calmly and with courage. Let us be honest with ourselves. There is no panacea for the present ills of all industry. The desired objectives may be accomplished only by hard, consistent, endless work by us as individuals. There is no short cut and we all know that is the truth.

A. W. ROBERTSON,
Chairman Westinghouse Electric & Manufacturing Company

So it goes. Some may find in this welter of attention an unwelcome solicitude on the part of the populace. But actually the degree of public apathy about the attacks surpasses the degree of public animosity toward the victim. Completely engulfing both these temperamental attitudes is a growing appreciation of the value of electric service. With it is a disposition to regard the errors of the industry as those of ado-

lescence. Any prodigy gets a lot of notice. When childish pranks give way to the constructive acts of manhood, then solicitude and chastisement likewise give way to parental admonition and paternal counsel. That's where we are now.

Meanwhile no part of the nation's huge tax deficit can be attributed to shrinkage in collections derived from loadings on the customer's electric dollar. The industry, as a servant in waiting, has contributed as much to the economic wellbeing as its beneficiaries would support. Proud of its beneficences, it quietly hopes that appreciation of them will ultimately puncture the fatuities in the assault upon its motives.

Transmutation of elements is no longer Utopian, but has become possible today within very restricted limits. Who knows where the future will take us?

GUGLIELMO MARCONI,
Scientist, Radio Pioneer.

Hope lies in engineering and research

FAILURE marks the record of any industry that becomes ingrown and self-satisfied. Progress can come about only through the encouragement of new ideas and new things. Basic values in any industry rest in the engineering and research personnel and not in the physical property or securities. This has long been recognized by the electrical industry, and therein lies the greatest hope for its future.

In communication, for instance, the new teletype seems to have sounded the death knell of old-style telegraphy. It makes it possible for a Brisbane to dictate his syndicated editorials to the linotypes of all papers. It makes many operations unnecessary and saves much time. Moreover, no one can say how soon space communication can take place in privacy without wires or cables to carry the message. Radio, despite the apparent completeness of the art, is still embryonic. Some day home talking pictures and home television will be added to the art on a large scale, and the wired-radio experiments to be made in Cleveland point to other radical changes in the art of broadcasting as it exists at present.

Lord Macaulay said that "no one can say that Christianity is a failure, it has never been tried." His famous remark applies with equal force as a reply to those critics who cry out that state regulation of the public utilities is a failure.

FRANK P. MORGAN,
Alabama Public Service Commission

Even the power field is not static. Despite the great developments in steam turbo-generators, the research workers will not rest content with prime movers having a thermal efficiency of about 30 per cent. They are still at work on the gas turbine, on the two-fluid cycles, on the internal-combustion engine and on the coaldust engine. Still more recently daring and very promising experiments have been under way with wind power through the application of Bernouli's principle to the Flettner rotor. But, in addition to generation, research work is gaining ground in direct-current transmission and in the general field of electronic applications for replacing electromagnetic devices. Just recently Marconi predicted broadcast energy for light, heat and power.

Possibly the most marked developments lie in the realm of light. Here again the low light efficiency of the resistance filament has spurred research. The gaseous-lighting art is advancing rapidly and appears promising, at least as a supplementary part of commercial lighting. Parallel with research lie the development of health lighting and the growth of architectural and built-in lighting as commercial enterprises.

Still further back in the research field there is the astounding possibility of mastering atomic energy. While yet distant, the vigor of the research work under way may bring an entire revolution in our present equipments and methods for obtaining and using energy. With this picture in mind it is pitiful to get into a mood of depression. It is false judgment that causes executives to economize on engineering and research. Burying its head in the sand never saved an ostrich, nor will it save an industry. The wise executive will agree with Dr. Whitney and say: "I would not dare to say what electricity may do in the future. We are always making the mistake of supposing we have

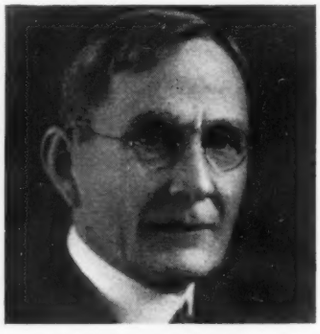
exhausted our knowledge in any direction." The present status of the electrical industry is just a starting point from which to soar.

Electrical manufacturers hold firm

IN COMMON with all manufacturers, the electrical group endured the conditions caused by falling business in 1931 and see little prospect for improvement in 1932. Exports dropped about 28 per cent, production in plants dropped 13 per cent, and dollar values of orders and billings dropped about 22 per cent. Power equipment for utilities and industrial firms suffered most and appliances least from the effects of the depression.

But, despite the slow recession of business during the year, the stability of the manufacturing industry remained very good. Most of the companies entered the depression with surplus funds and with inventories and capital investments written down to a minimum. Most of them held price levels firmly and did not succumb to the fallacy that price cutting would increase business. Moreover, the fall in copper and commodity prices contributed to holding earning margins up beyond the danger line. A very encouraging aspect of the situation was the maintenance of an aggressive selling organization and the free use of cooperative efforts in sales, such as the refrigeration campaign. Notable contributions were made by individual manufacturers to business stability and the mitigation of unemployment, and in national bodies considering these matters the National Electrical Manufacturers' Association holds a high place.

Thus as the new year starts the manufacturers are found to be dissatisfied with their volume of business and courageously determined to increase it. They are doing much to study their organization so as to develop better and more economical selling. They are working hard and grumbling very little. They are to be congratulated upon their attitude and can be counted upon to fight for better business.



We are now emerging from what perhaps is the most far-reaching of the cyclic economic disturbances that have occurred during my forty-odd years of active service in the electrical industry. Far from being downcast, I have supreme confidence that we are at the beginning of a new era even more significant in its possible advances than any that has gone before.

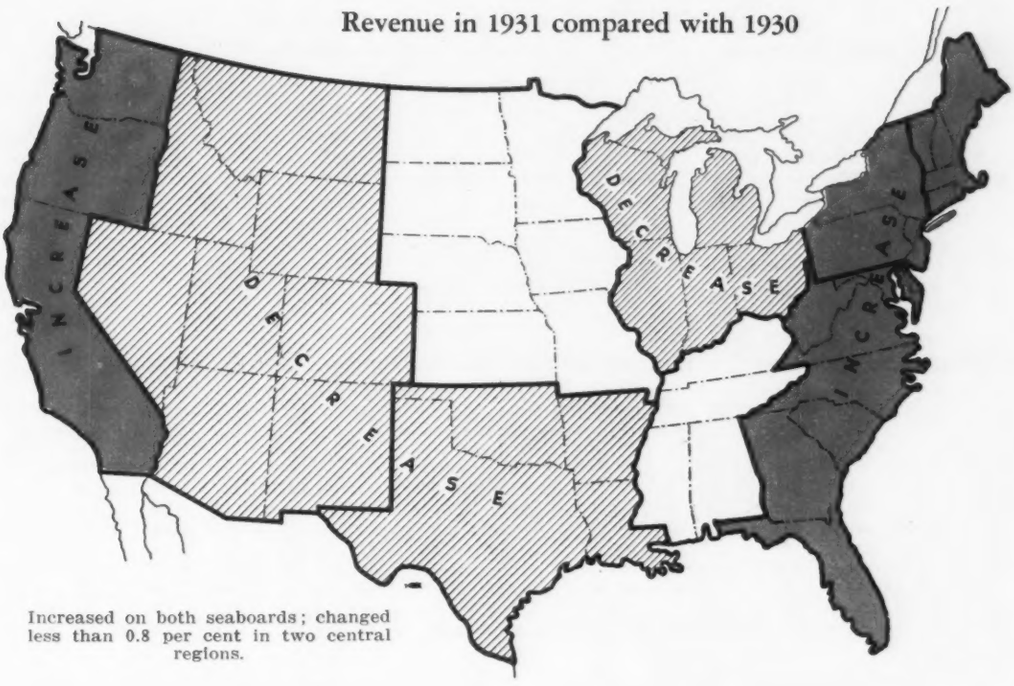
C. E. SKINNER,
President American Institute of Electrical Engineers.

Security markets block utility expansion

MEASURED by use of electric service, this country is stable, and those who supply this service are the most prosperous business group in the nation. Compared with 1930, the year witnessed a decrease of 4 per cent in energy generated, 1 per cent in total revenue and 2.8 per cent in operating expense. A large decrease in use of industrial energy was partly offset by an 8 per cent increase in domestic use, and the financial balance sheets were held level by reducing operating expenses and selling high-rate business.

Thus the utilities measure up to about 100 per cent when weighed by statistics, and in the non-statistical intangibles also it can be said that 1931 saw better conditions. Public relations were improved by the adoption and use of local property programs; utility organizations were improved by decentralizing management functions and by eliminating non-essential functions; utility properties were tuned and improved to give better and more economical service; utility rates were lowered; utility sales efforts were more aggressive, and utility managements adopted new and better plans for the conduct of the business.

As 1932 takes the stage the utilities are in good condition. They have no critical problems except those involved in supplying their markets and expanding their facilities. During 1931, despite bad security market conditions, the utilities were able to do more than a billion dollars of public financing at reasonable rates. Now, it is impossible to do public financing except with high-grade bonds or at unreasonable yields. It takes money to expand facilities to take on new business, and a blocked security market is the greatest handicap to expansion of industry at this time. It is responsible for the fact that little or no money for capital-account expenditures can be raised in security markets. No one can predict the end of this situation. Until it changes for the better customer-ownership and bond sales must be the source of new capital. Fortunately the industry is in a favorable position.



Light and Power Industry Continues Its Progress

ELECTRIC light and power is to be regarded in two aspects: An indispensable service in the conduct of American life as at present constituted; a vast industry. In the former view it may not be interrupted for a single minute without far-reaching and probably tragic consequences. This was dramatically illustrated when the proposal was rejected, only a few months ago, of cutting off public power for a brief interval, as a memorial to Thomas A. Edison.

This service reaches 24,676,000 customers, 120,000 more than at the end of 1930 and including 20,441,000 homes. In addition it reaches 3,613,000 retail commercial and 622,000 wholesale customers. It engages the activities of 285,000 employees. Of the urban population 86 per cent have service; a year ago it was estimated that 644,000 farms, or about 10 per cent of the total number, had electric connections, and the count was growing at the rate of 100,000 annually. Energy is being generated in power plants having an aggregate rating of 32,922,000 kw., of which 23,890,000 kw. is driven by steam, 425,000 kw. by internal combustion engines and 8,610,000 kw. by water power. The service requires the use of 210,000 miles of transmission lines operated at 11,000 volts or more, and at least 250,000 miles, or as much as our total railway mileage, if the census minimum of 6,600 volts is adopted. With the aid of this network it reaches uncounted villages and hamlets as well as all the larger communities. It extends and for years

Revenue for Electric Service

		Revenue from Ultimate Consumers (Thousands of Dollars)						
Year	Total	Total, Ultimate Consumers	Domestic	Retail Light and Power	Wholesale Power and Light	Municipal and Miscellaneous	Railways and Railroads	Other Sources*
1926	1,621,550	1,520,159	478,182	427,407	488,915	73,665	51,990	101,391
1927	1,802,656	1,661,033	523,689	482,136	519,075	82,996	53,137	141,623
1928	1,941,955	1,784,309	571,620	519,957	549,989	90,695	52,048	157,646
1929	2,105,900	1,938,520	618,799	555,640	613,171	98,646	52,264	167,380
1930	2,151,150	1,990,955	664,441	575,598	590,992	107,841	52,083	160,195
1931	2,137,490	1,977,200	695,100	568,640	553,600	110,300	49,560	160,290

*Company owned railway departments, sales to other public utilities for resale, etc.

Distribution of Central Station Energy

(Millions of Kilowatt-Hours)

Year	Generated	Total Including Energy from Other Sources	Electric Railway Depts.	Other Company Use	Available for Distribution	Distributed to Ultimate Consumers: Total	Domestic	Retail Light and Power	Wholesale Power and Light	Municipal and Miscellaneous	Railway and Electrified Railroads	Losses
1926	69,158	70,476	1,529	1,023	67,924	56,090	6,827	9,485	32,615	1,786	5,377	11,834
1927	74,686	76,370	1,348	1,111	73,911	61,251	7,676	10,766	35,263	2,003	5,543	12,659
1928	82,927	83,395	1,330	1,235	80,830	66,988	8,619	11,692	38,903	2,223	5,551	13,842
1929	91,421	92,757	1,279	1,201	90,277	75,295	9,773	13,106	44,326	2,450	5,640	14,983
1930	89,952	91,957	1,184	1,306	89,467	74,906	11,018	13,944	41,621	2,735	5,588	14,561
1931	86,679	88,428	1,050	1,372	86,006	72,023	11,868	13,956	38,106	2,781	5,312	13,983

Central-Station Revenue for Electric Service and Energy Output by Regions, 1912-1931

(Millions of Dollars)								(Millions of Kilowatt-Hours)							
1912	1917	1922	1927	1928	1929	1930	1931	Region	1912	1917	1922	1927	1928	1929	1930	1931
28.5	52.5	100.9	156.8	170.1	185.97	188.75	191.68	....New England....	865	1.836	3.280	4.750	5.350	5.997	5.832	5.973
87.3	149.7	290.3	499.9	534.4	574.45	598.03	603.30	...Middle Atlantic...	3.548	7.659	11.012	19.282	20.034	21.605	22.003	21.421
63.4	114.8	241.9	435.6	470.7	511.90	506.16	485.10	..E. North Central..	2.528	5.757	10.211	18.212	20.537	22.786	21.623	20.376
27.5	50.8	100.9	150.3	159.1	169.23	175.18	176.60	..W. North Central..	713	1.776	3.218	4.549	4.816	5.387	5.739	5.617
16.1	30.1	75.3	169.7	180.9	193.90	201.10	204.38	.....S. Atlantic.....	730	1.745	4.691	8.445	10.362	11.763	10.751	10.106
7.5	13.5	31.3	69.0	74.1	79.99	81.15	80.88	..E. South Central..	228	1.049	1.495	2.777	3.056	3.398	3.546	3.641
12.2	19.2	42.9	95.8	110.2	128.30	134.22	127.88	..W. South Central..	234	483	1.338	3.275	4.027	4.890	5.047	4.539
13.8	26.1	37.6	52.7	55.7	59.10	58.41	56.59	.....Mountain.....	845	2.036	2.290	3.390	3.723	3.785	3.496	2.953
30.8	45.4	99.3	172.8	186.7	203.06	208.15	211.08	.....Pacific.....	1.878	3.097	6.126	10.006	11.022	11.810	11.915	12.053
287.1	502.1	1,020.4	1,802.7	1,941.9	2,105.90	2,151.15	2,137.49	...United States...	11.569	25.438	43.560	74.686	82.927	91.421	89.952	86.679

has extended to every incorporated place of 2,500 inhabitants or larger as reported by the census. With possibly a few exceptions, at most, the statement applies down to the 1,000 group. Interconnections provide security against local deficiencies of power. Untold thousands of miles of distribution circuits carry the service to homes, stores, offices and factories of the consumers.

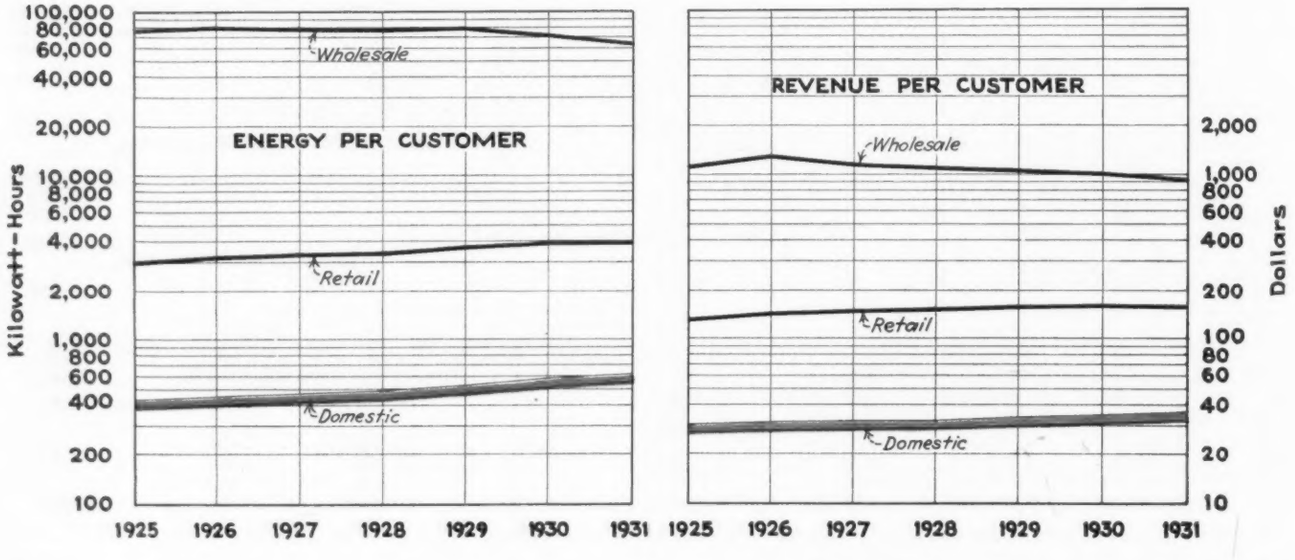
In the industry's power plants 86,679,000,000 kw.-hr. was generated in 1931. A small additional amount was imported from Canada or purchased from other outside sources. Deducting transmission and distribution losses, energy used for company-owned railways and other company use, 72,023,000,000 kw.-hr. was distributed: 16.4 per cent to domestic users, 19.4 per cent to retail commercial and 52.8 per cent to wholesale customers, the balance to municipalities, railroads, electrified railways and miscellaneous users. To generate the energy it burned 36,300,000 tons of coal, 7,770,000 bbl. of oil and 135,000,000,000 cu.ft. of natural gas.

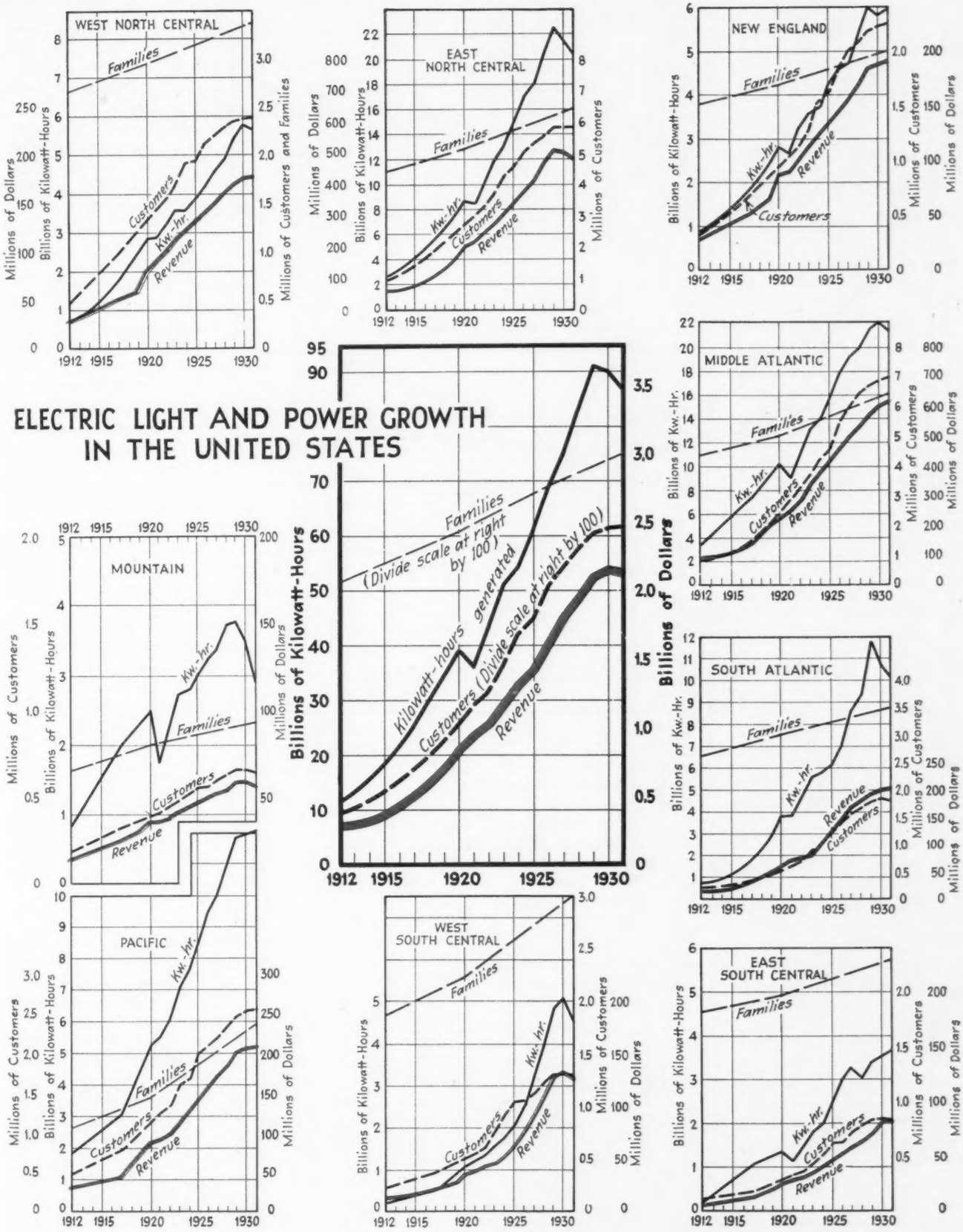
Reduction of energy consumption in the country as a whole did not obviate the need of new plants. On some systems the load increased. Serious scarcity of water power emphasized the necessity of having adequate steam reserve. Work on hydro-electric plants in progress was continued. As a result new plants and additions aggregated 1,403,000 kw., 836,500 kw. in thermal and 566,500 kw. in water power. Abandonment of old equipment makes the net increase close to 1,000,000 kw., as accurately as can now be determined.

As a business, the industry employs a capital investment of $12,400,000,000; it invested $633,000,000 in new plant during 1931, will need to spend another $450,000,000 for neded extensions in 1932, earned a total

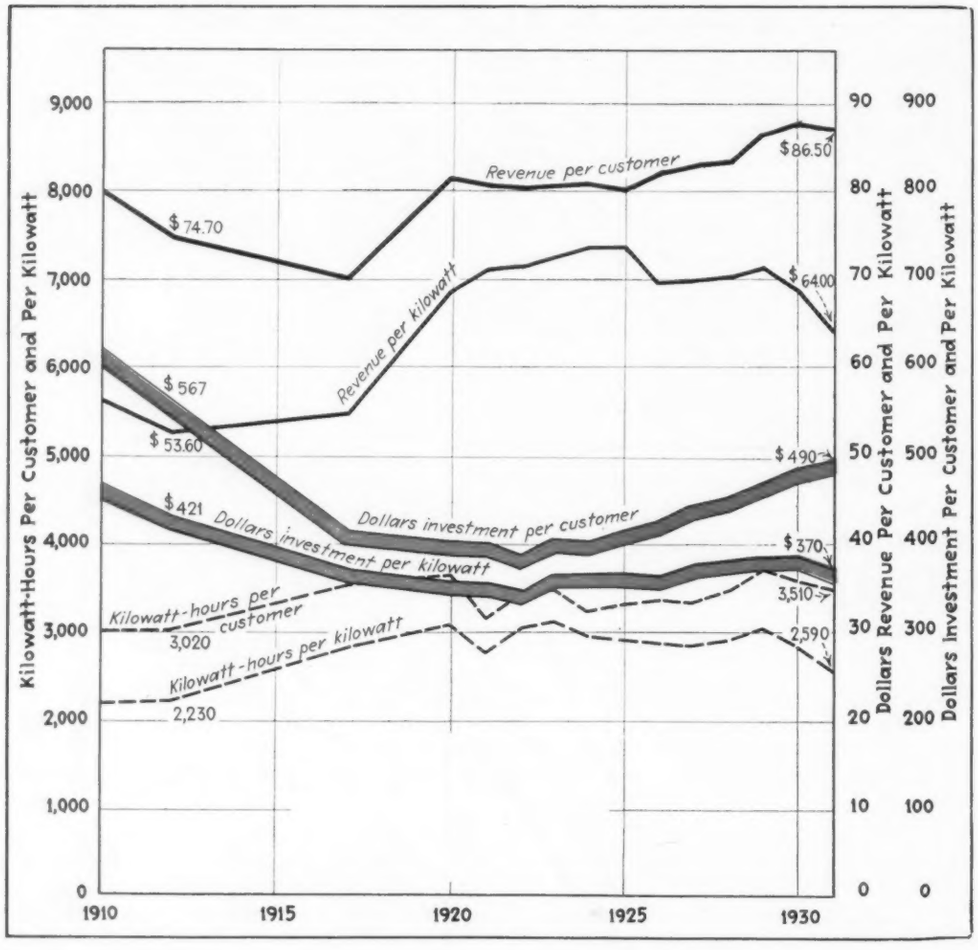
Energy and revenue per customer, by classes

Greatest rate of increase—steepest slope—in domestic business.





National and regional growth in energy generated, revenue and number of customers of the electric light and power industry since 1912



revenue of $2,137,000,000 during the past year, disbursed $920,000,000 for operating expenses (not including taxes, interest, depreciation and amortization) and paid more than $200,000,000 in taxes.

Of the revenue, $1,977,000,000 came from ultimate consumers, the balance from other utilities for energy for resale and from company-owned railways. The domestic business contributed $695,100,000, retail commercial sales $568,600,000 and wholesale power and light $553,600,000. Additional smaller amounts came from other sources.

New financing through security houses, including that for refunding, amounted to $1,342,000,000, and an additional $150,000,000 in sales directly to customers brought the total close to $1,500,000,000.

In the matter of corporate changes the past year was a quiet one. The most important event was the consolidation of properties in eastern Massachusetts; transfers of other, smaller, operating units resulted from the partial or complete dismemberment of a few holding companies, none of outstanding importance.

Financial distress of operating properties was conspicuous by its absence. Even in the areas most dependent on industries hard hit, power companies made a good showing and are facing 1932 with definite and in many instances liberal programs for improvements.

Above the level of 1929

In 1929, the peak year of American industry, the gross revenue for electric light and power was $2,105,900,000. It rose 2.5 per cent in 1930, then fell 0.7 per cent in 1931. The revenue in 1931 was larger by 1.5 per cent than in 1929. Energy generated was at a maximum in 1929, 91,421,000,000 kw.-hr. It decreased 1.6 per cent in 1930 and another 3.6 per cent in 1931.

The decrease during the two years was proportionately smaller than in 1920-21, when the industry had less than half its present size. On that occasion the upward movement was promptly re-established. By 1923 the output was 30 per cent greater than in 1920, the year before the recession. Thereafter the increase continued at a rate that doubled the output every six or seven years, until 1929.

Analysis of the distribution of energy to ultimate consumers, as announced by the National Electric Light Association for each year from 1926 to 1930 and as shown in an accompanying table, with 1931 partly estimated, reveals uninterrupted growth in domestic sales, 7.7 per cent greater in 1931 than in 1930. Retail commercial sales held steady. The only important shrinkage was in wholesale power and light, 8.5 per cent. In 1921 the situation was similar, compared with 1920. The subsequent growth is a matter of record.

Energy for large industrial use—that is, sales at wholesale—now constitutes 53 per cent of all the energy delivered to ultimate consumers and in an active year like 1929 constituted 59 per cent. This is so large a part that the effect of a severe decline in industrial operations outweighs the gains in other energy sales.

In the retail field the maintaining of sales at the previously existing level, and in particular the climb in domestic consumption from 548 kw.-hr. per home served in 1930 to 580 kw.-hr. in 1931, deserve notice. In combination these considerations not only point to further growth but indicate that when the recovery comes it will be rapid.

In like fashion with the revenue—that for residential energy increased, 4.8 per cent, for retail commercial it declined by 1.2 per cent, for wholesale 3.8 per cent. Thus the average rate per kilowatt-hour fell in the first two classes, but rose in the third, as it logically should. The domestic consumer benefited by the longer hours of use, probably with a negligible increase of peak demand. The industrial user did not, in general, reduce his maximum

Operating and Maintenance Expenses of Central Stations

(Millions of Dollars)

Including taxes, interest on funded and floating debt, depreciation and sinking fund

	United States	New England	Atlantic	North Central	South Central	Mountain Pacific
1907.....	134.2	12.6	49.7	39.8	9.5	22.6
1912.....	234.6	21.4	84.1	76.4	15.0	37.7
1917.....	426.6	42.0	153.4	144.6	27.6	59.0
1922.....	859.6	83.0	309.0	296.4	58.8	112.4
1927.....	1,318.3	....	.....	.....	.....	.....

Exclusive of taxes, interest on debt, depreciation and sinking fund

1917.....	284.8	29.7	107.8	99.6	17.6	30.1
1922.....	553.0	57.7	202.7	197.0	39.1	56.5
1927.....	828.2	71.2	308.2	282.9	85.8	80.1
1928.....	866.3	75.6	327.3	280.8	91.4	91.2
1929.....	934.9	79.7	340.4	315.6	102.9	96.3
1930.....	942.2	79.6	350.4	311.8	105.4	99.0
1931.....	920.3	77.4	348.2	297.0	97.5	100.2

demand, as numerous individual instances reveal, but did use less energy.

Rates decline, home use expands

The rate for domestic energy has been steadily declining. For energy used in 1931 the average was 5.87 cents per kilowatt-hour; for 1930, 6.03; for 1929, 6.33. It is now 16 per cent lower than it was in 1926. Meanwhile revenue per customer, $31.65 in 1929, $33 in 1930, rose to $34.10 in 1931. The changes can readily be traced to the expanding use of electric appliances, and in the past few years notably to the installation of refrigerators, ranges and water heaters. Continued large sales of these appliances and the present lack of saturation of the market leave little room for doubt as to the future downward trend of rates and upward trend of revenue in this branch of the electrical industry.

A second year of abnormally low stream flow reduced the output from water power to 32.7 per cent of the total, compared with 34.1 per cent in 1930 and 35.4 per cent in 1929. From fuel, energy was generated with an average consumption of 1.56 lb. of coal per kilowatt-hour, an improvement of 0.06 lb. in a year. In 1919 the rate was 3.2 lb. per kilowatt-hour.

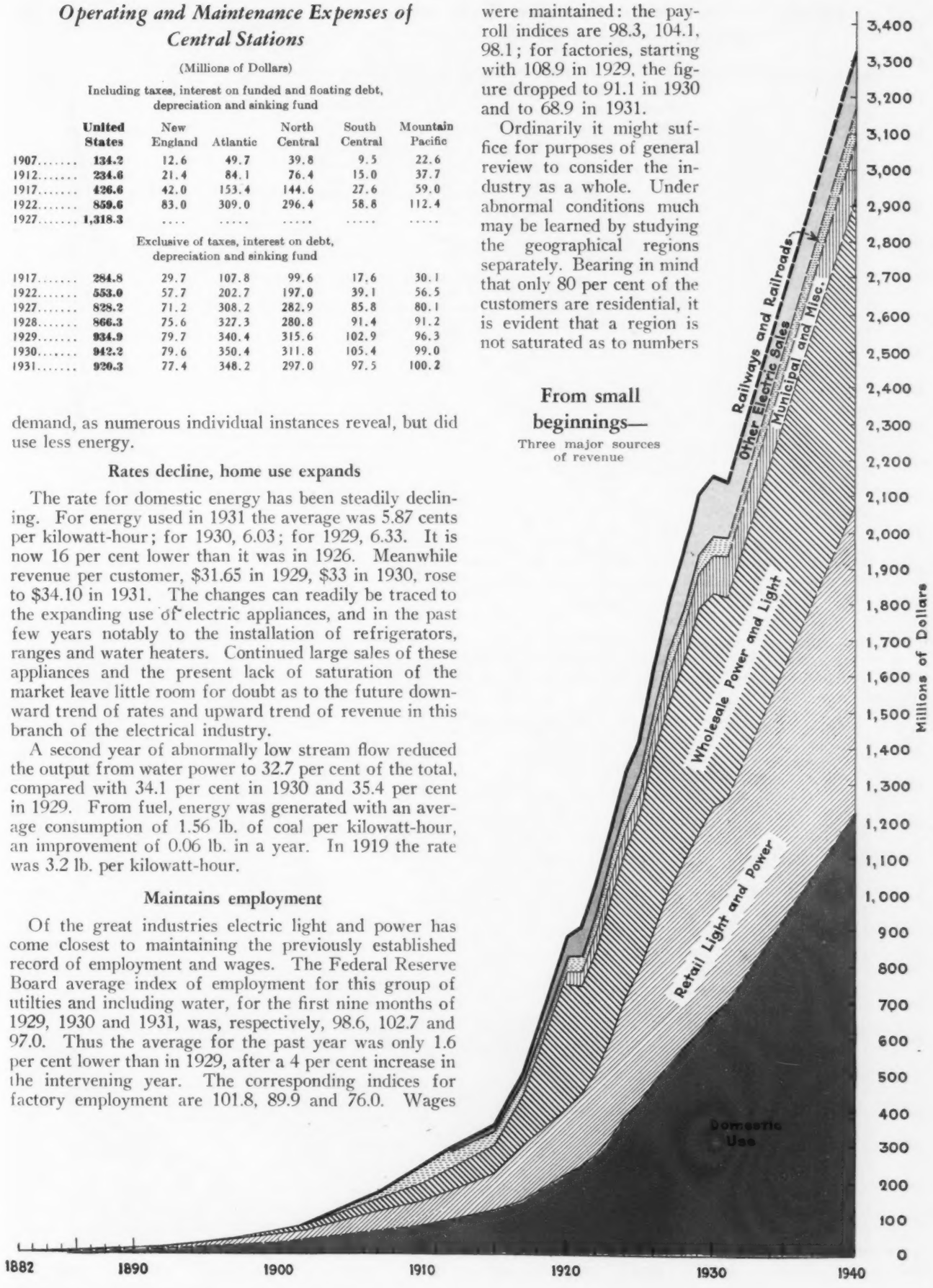
Maintains employment

Of the great industries electric light and power has come closest to maintaining the previously established record of employment and wages. The Federal Reserve Board average index of employment for this group of utilties and including water, for the first nine months of 1929, 1930 and 1931, was, respectively, 98.6, 102.7 and 97.0. Thus the average for the past year was only 1.6 per cent lower than in 1929, after a 4 per cent increase in the intervening year. The corresponding indices for factory employment are 101.8, 89.9 and 76.0. Wages were maintained: the payroll indices are 98.3, 104.1, 98.1; for factories, starting with 108.9 in 1929, the figure dropped to 91.1 in 1930 and to 68.9 in 1931.

Ordinarily it might suffice for purposes of general review to consider the industry as a whole. Under abnormal conditions much may be learned by studying the geographical regions separately. Bearing in mind that only 80 per cent of the customers are residential, it is evident that a region is not saturated as to numbers

From small beginnings—

Three major sources of revenue



Energy Generated in Central-Station Plants and Revenue for Electric Service

Fifty Years' Growth in Energy

Year	Kw.-Hr. (Millions)	Year	Kw.-Hr. (Millions)
1882	Small	1919	34,900
1887	175	1920	39,519
1892	300	1921	36,970
1897	800	1922	43,560
1902	2,337	1923	51,133
1907	5,862	1924	54,413
1912	11,569	1925	61,159
1913	13,000	1926	69,158
1914	14,400	1927	74,686
1915	16,175	1928	82,927
1916	21,230	1929	91,421
1917	25,438	1930	89,952
1918	29,200	1931	86,679

Thirty Years' Growth in Revenue*

Year	Revenue	Year	Revenue
1902	$85,700,605	1921	911,550,000
1907	175,642,338	1922	1,020,439,000
1912	302,273,398	1923	1,180,850,000
1913	312,200,000	1924	1,322,000,000
1914	336,980,000	1925	1,425,160,000
1915	360,000,000	1926	1,621,550,000
1916	436,000,000	1927	1,802,655,000
1917	526,894,240	1928	1,941,955,000
1918	664,850,000	1929	2,105,900,000
1919	773,650,000	1930	2,151,150,000
1920	882,720,000	1931	2,137,490,000

*Total revenue includes sales of energy for resale; in earlier years also includes revenue from other sources, but this constitutes only a small fraction of the total.

responsibilities imposed by this relationship and on the unanimous pursuit of a wise policy based on that recognition.

until customers exceed families by 25 per cent. This condition is far from fulfilment in the entire South, in the North Central States, as a group, and in the Mountain region. Only in New England, in the Middle Atlantic and in the Pacific States is it being approached. Nowhere has it been reached.

In only three regions was there a decrease in revenue in 1931, the East North Central, the Southwest and the Mountain. Since the dominant industries in those territories are admittedly far below the normal rate of operation, and since that normal rate is bound to be re-established, the future holds definite promise of early improvement for the power industry.

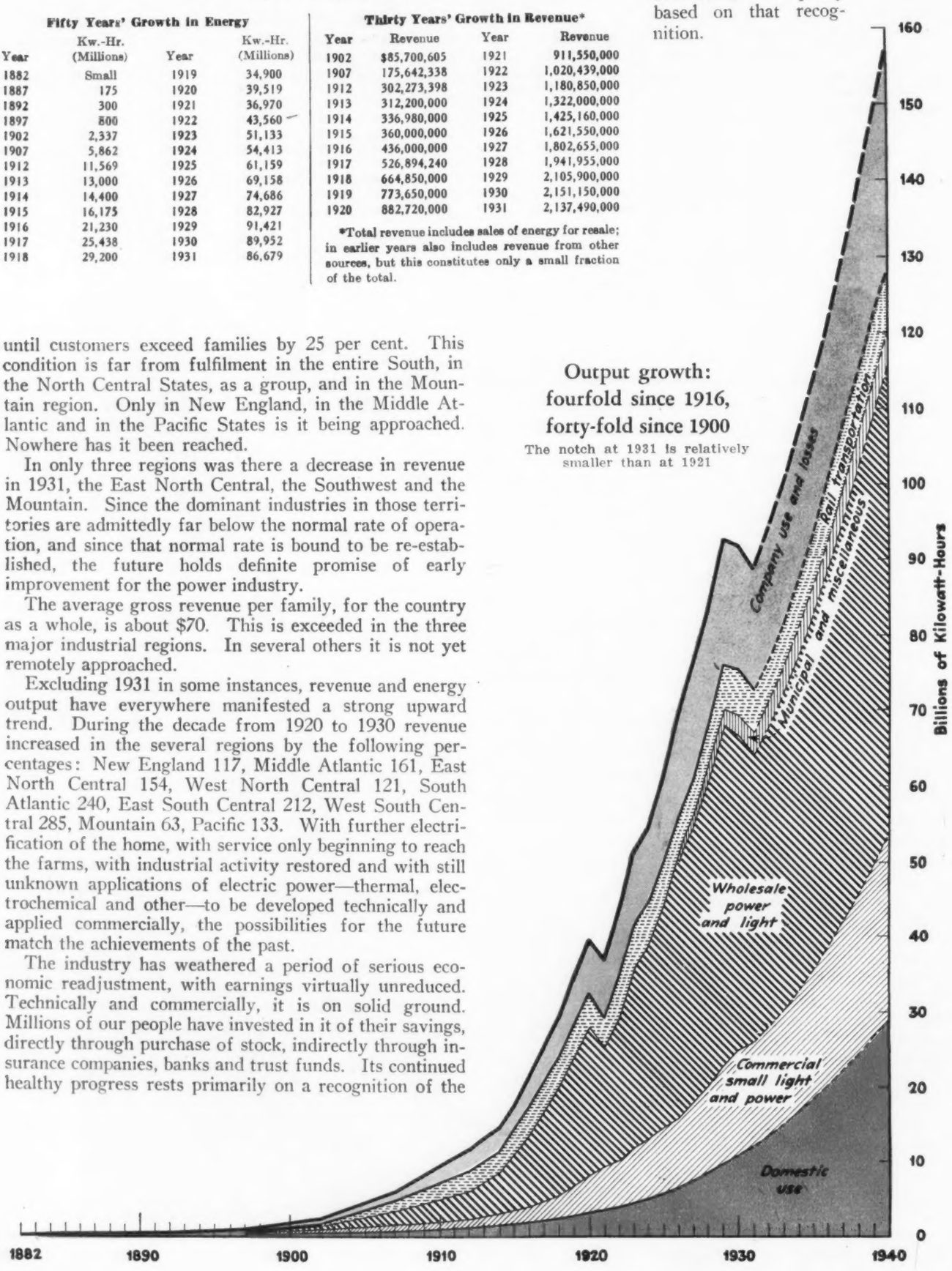
The average gross revenue per family, for the country as a whole, is about $70. This is exceeded in the three major industrial regions. In several others it is not yet remotely approached.

Excluding 1931 in some instances, revenue and energy output have everywhere manifested a strong upward trend. During the decade from 1920 to 1930 revenue increased in the several regions by the following percentages: New England 117, Middle Atlantic 161, East North Central 154, West North Central 121, South Atlantic 240, East South Central 212, West South Central 285, Mountain 63, Pacific 133. With further electrification of the home, with service only beginning to reach the farms, with industrial activity restored and with still unknown applications of electric power—thermal, electrochemical and other—to be developed technically and applied commercially, the possibilities for the future match the achievements of the past.

The industry has weathered a period of serious economic readjustment, with earnings virtually unreduced. Technically and commercially, it is on solid ground. Millions of our people have invested in it of their savings, directly through purchase of stock, indirectly through insurance companies, banks and trust funds. Its continued healthy progress rests primarily on a recognition of the

Output growth: fourfold since 1916, forty-fold since 1900

The notch at 1931 is relatively smaller than at 1921



Utility Prospects Fair

1. Are 1932 prospects for business increases good, bad or fair?
2. Upon what classes of business should sales efforts be concentrated in 1932?
3. Are security market conditions affecting the ability of the industry to expand?
4. Do you believe legislation detrimental to utilities will be enacted by Congress?
5. Do you believe kilowatt-hour taxation will be adopted quite generally by the states?

A. F. Hockenbeamer

1. Prospects for business increases in 1932 are fair.

2. Sales efforts are likely to yield the best results in 1932 if concentrated on retail outlets, such as domestic heating, lighting, cooking, refrigeration, etc., on street and highway lighting and on commercial lighting and power.

3. Security market conditions are admittedly such that it is difficult to secure new capital. How long this condition will last is anybody's guess. The ability of the industry to expand its business will undoubtedly be affected by this situation.

4. I cannot bring myself to believe that Congress will, under existing conditions, throw any more "monkey wrenches" into the economic situation by passing legislation adverse to utilities.

5. No.

A. F. HOCKENBEAMER,
President Pacific Gas & Electric Company.

R. H. Ballard

1. I believe that 1932 prospects for business are fair. I would consider them good but for the fact that Congress is in session and that 1932 is the Presidential election year. Government and political interference with business is, in my opinion, one of the principal, if not the principal, reasons for present business conditions. Business confidence has been shaken more by political agitation of one kind or another than by any other single influence. We therefore have this uncertain factor in the situation, which will tend to retard business recovery during 1932.

2. I believe that in the electric utility business our sales efforts should be concentrated upon the increase of the domestic load.

3. I do not think that security market conditions are appreciably affecting the electrical industry's expansion. In general, there is an ample supply of credit available to the electrical utilities.

4. I do not believe that legislation adverse to the electric utilities will be enacted in the next Congress. There will, however, be a great deal of oratory expended in this direction.

5. I have no information upon your fifth question as to taxation.

R. H. BALLARD,
President Southern California Edison Company.

J. E. Davidson

Should it happen that conditions in 1932 improve but little, I then do not believe that business conditions in this section, as they pertain to the light and power utilities, will be any less satisfactory than they now are. Should there be an improvement, I believe it will be quite quickly reflected in this section of the country. I say this because the farmers, upon whom we are all dependent, reduced their expenses and any extravagances that might have prevailed several years ago, due to the prices of grains, live stock, etc., being out of line with the commodities of the other industries. For this reason I believe this section of the country has been less affected by the depression than have other sections.

Generally speaking, I believe the utilities should be optimistic and full of fight, realizing that they have a service to render to the American people. There has never been a time more than now when the public needed the benefits of electricity, through economy, convenience, elimination of drudgery in the home, and so on.

Every effort, I think, should be concentrated on selling service-giving apparatus for the home that will be of the most value to the homekeeper.

1. Fair.

2. Refrigeration, ranges—all home labor-saving devices.

3. Yes, to some extent.

4. No, not during the next session at any rate.

5. No.

J. E. DAVIDSON,
President Nebraska Power Company.

I have no confidence whatever in any predictions. This is one of the times when the saying holds that "they are blessed who expect nothing, or they shall not be disappointed."

1. Prospects for business increase in 1932 are fair.

2. I cannot give a general answer, because what would be a good direction of effort for me might be all wrong for my neighbors, or for the other side of the country. Every manager will have to pick his own pup.

3. I do not think that security market conditions are at the moment limiting expansion of our industry. Practically all of us could do more business with existing equipment and would be glad to do it.

4. I decline even to guess at what Congress will do. Congress itself will not know until it has been fussing for several months.

5. I do not think there will be a general move toward kilowatt-hour taxation. My observation is that *at last* the municipalities and the states have discovered that they have been spending too much. There is, however, when an industry is paying more than 10 per cent of its gross earnings to tax gatherers, occasion for an intelligent and persistent campaign against such indirect taxation.

ALEX DOW,
President The Detroit Edison Company.

Alex Dow

M. S. Sloan

Conditions being what they are, our electrical companies in New York City have been fortunate. Output this year has exceeded slightly that for last year, but not by any means to the extent we consider normal. So far as I can see, the new year will be on about the same basis. There is practically no building in Manhattan, and not much in the other boroughs. Manufacturing is greatly curtailed and hundreds of stores and shops are vacant. We are facing these facts. Our expenditures for the year will be held to a minimum. We are built well ahead on plant capacity and capital investment will be in transmission and distribution facilities.

Our sales effort will be concentrated on the residential load. Appliance sales have held up well, and because of this and our promotional rate schedule we believe we can increase home use of current in spite of unemployment and the doubling up of families to save rent.

M. S. SLOAN,
President New York Edison Company.

J. F. Porter

J. H. Gill

1. Our prospects for an increase in business for the year 1932 are fair.

2. We will work all classes of service, but we expect the best results from residence and small power service.

3. The security market does not affect our business as our company is fully financed and the industries in our city are such that they do not require public financing.

4. It is difficult to prognosticate as to just what Congress will do, but a sane consideration of the matter would indicate that it could not consistently pass legislation adverse to the utility industry.

5. No! It seems unreasonable that many states would adopt such a method.

JOSEPH F. PORTER,
President Kansas City Power & Light Company.

1. In the territory served by the Florida Power & Light Company we feel that our prospects for business in 1932 are such that we may reasonably expect about the same volume of business that we experienced in 1931, which, in general, we would classify as fair. What holds with respect to our business in this territory is generally true with respect to other lines of business undertaken in this area.

2. Since the latter part of 1929 we have been increasingly concentrating our selling effort in an effort to increase our residential business, feeling that under conditions prevailing here this offers us the greatest possibilities for increases. In so doing we have departed somewhat from traditional lines. Our efforts are directed primarily to selling to residential customers the full use of electric service. Salesmen being employed in this work, however, are not permitted to sell merchandise, but devote their entire time and attention to the sale of electric service. For the past two years the results have been excellent and we expect further increases during the year 1932.

3. Our business, to a degree possibly more than elsewhere, is peculiarly sensitive to conditions throughout the country and to a large degree to conditions prevailing in the security market. One of the items upon which our communities are largely dependent is the winter tourist crop and the movement of the winter tourists is influenced to a great degree by the action of the security market.

JOE H. GILL,
President Florida Power & Light Company.

On the record of sustained earnings and steady extension of service achieved by the electric light and power industry throughout the business depression, I am inclined to view the prospects for 1932 with assurance. We have come through this time of

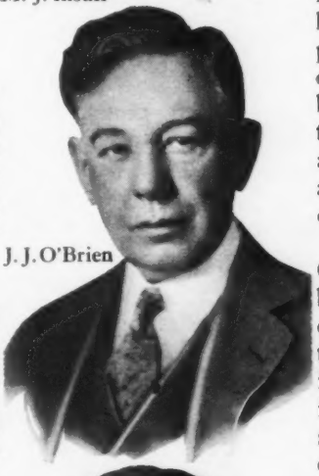
slow business with but a trifling reduction of our employment rolls—only 3 per cent at the last check-up. We have invested well over a billion dollars to provide new and better power facilities for American homes and industries when times improve, thereby making an unmatched contribution to the fight against unemployment.

But the business and the welfare of the American people in 1932 are largely dependent upon the courage and common sense of the people themselves—as manifested in their ability to restrain destructive activities and their support of our financial and credit structure.

MARTIN J. INSULL,
President Middle West Utilities Company.

M. J. Insull

The electric and gas utilities have added a considerable amount of electric generating and gas distribution facilities during the depression period, preparing for a time when general business conditions will be sufficiently improved for industry to take full advantage of available service and service facilities.


J. J. O'Brien

Our company has contributed materially toward this general progressive program of the industry. Its subsidiaries have continued to make service available to increasing numbers of people, some of them in small and remote communities and on farms, at low rates; in some cases even reducing rates. A concentrated effort has been made to retain operating personnel intact, endeavoring constantly to effect efficiencies and economies in operating methods rather than to curtail wages and employment.

Throughout 1930 and 1931 every branch of industry searched diligently for optimistic signs, with small success. In my opinion, 1932 will see an upturn, for really hopeful signs of underlying improvement, however slight, were evident during the last two months of 1931. In the territories served by the Standard Gas & Electric Company system a notable improvement in prices and demand for farm products, especially dairy and poultry products, was indicated during these last two months. Better conditions were reported particularly in the agricultural districts of the Pacific Northwest and in Minnesota and North Dakota. Increased prices for oil are aiding petroleum-producing territories, and improvement is therefore being shown in those sections where electricity is employed extensively in the production and distribution of oil. Another favorable factor in the general situation is the fact that there were fewer bank failures toward the end of the year, and that hoarding decreased. All these evidences of better general business conditions naturally affect the utility industry, and give justifiable ground for the opinion that the industry should show better results in the year 1932.

C. L. Edgar

The electric light and power industry is still under investigation by the Federal Trade Commission. During 1931 the major portion of the Standard Gas & Electric Company hearings were completed. From a legislative standpoint, it is hardly conceivable that Congress will enact measures harmful to public utilities, as it would seem unwise to hamper an important industry in a time of such economic stress; in addition there are many more important matters up for its consideration.

In the Standard Gas & Electric Company system marked increases have been shown in residential service and commercial business has been holding its own fairly well. Improvement has not occurred in general industrial load. To improve this load, it will be necessary that we continue to exert intensive sales efforts during 1932, and it will also be necessary to give intelligent sales attention to all other classes of business in order to realize improvement.

The companies comprising the Standard Gas & Electric Company system are in a better position at this time to offer a high quality of service at reasonable rates than they have even been, and with improvement in general industrial conditions, resulting in increased use of electricity and gas and other services rendered the public, a marked effect on the earnings of the company should be expected.

JOHN J. O'BRIEN,
President Standard Gas & Electric Company.

F. D. Comerford

The electric light and power industry has barely completed its first half-century of existence. During the pioneer days it struggled with problems and overcame difficulties which at times seemed unsurmountable, so that we who have witnessed a moderate degree of success in spite of disheartening conditions and the opposition of even nature itself, would not be true to our traditions if we allowed our faith and courage to weaken in the face of misleading rumors and groundless fears.

I cannot predict how soon a change for the better will materialize, but I doubt not that it will come, and come the sooner the more we apply ourselves to the performance of the tasks which confront us instead of worrying over imaginary misfortune which we fear may overtake us.

Edison, the inventor, the philosopher, the man, was the founder and also the inspiration of our industry throughout its history and the advice he gave on Edison Day, June 11, 1931, should become a classic. I can do no better than repeat what he then said:

"My message to you is, be courageous. I have lived a long time. I have seen history repeat itself again and again. I have

seen many depressions in business. Always America has come out stronger and more prosperous. Be as brave as your fathers before you. Have faith. Go forward."

C. L. EDGAR,
President
Edison Electric Illuminating Company of Boston.

The closing weeks of 1931 found our country in an acute state of nerves. Credit of private industry was either impaired or non-existent. Even the credit of municipalities was generally poor. Employment was at a low ebb. Many were drawing their deposits from strong banks and hoarding, seemingly unconscious of the fact that money is no better than the government and the government little stronger than the banks, insurance companies and industries that support it. Our country has all the wealth and resources that it had in 1929. What if all the credits abroad should prove uncollectible? Their aggregate amount is negligible compared to the wealth of this country.

Our bankers and business leaders have become unduly sensitive to local political developments in Europe. When the Hitlerites in Germany make a gain in some remote municipal election our securities have a sinking spell; yet I believe practically it makes not the slightest difference to the business of this country whether Hitler or Bruening dominates German policies. We should devote our time and energy to developing and protecting the home market and forget Europe, or rather leave its problems to our leaders, who can be trusted to do what is best for our country.

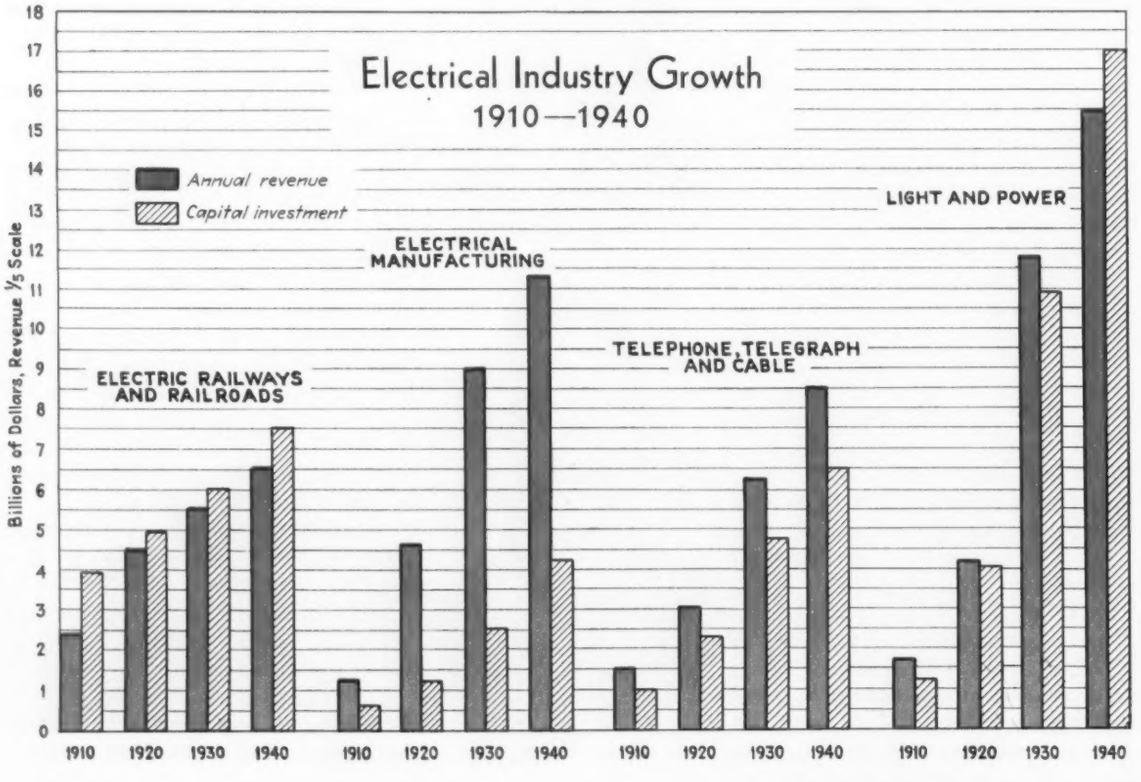
Above all, each of us, whatever his or her particular politics may be, should stand by and support our leaders in government. There is no better example, in my judgment, of real patriotism than the way in which the English people have rallied to their leaders. We should do the same in the nation, states and municipalities. It seems to me the severest test of democracy is whether in a crisis the people will rally to the support of their chosen leaders. The most constructive development would be for our people to say to their representatives in Congress, in state legislatures and in municipal councils: "We will not countenance partisanship and selfish political plays. We want our leaders supported as long as they remain in office."

The electrical industry has suffered with other industries in this depression. We have a large plant investment not presently needed. But, by and large, the industry has proved its stability. The depression may remove from the industry some elements and practices that were not healthy for the rest of the industry. Every crisis does this. But the industry will emerge stronger and sounder than ever.

A very serious problem to our industry is the burden of extravagant government. We are no different from other industries in this respect. Our customers must be made to realize that the waste and extravagance in government more and more will fall on them. The reduction in rates that has been steady during the last decade may be stopped by the burden of supporting certain activities of government, which are, to a substantial extent, parasitical and unnecessary.

I believe there is a double duty on every American business man in this New Year—first, he should have confidence that conditions will improve during the coming year, and second, if his own circumstances permit, he should do everything possible to relieve distress by contributing employment or money or both to those who have no employment.

FRANK D. COMERFORD,
President New England Power Association.



Manufacturing Leaders Comment on Business

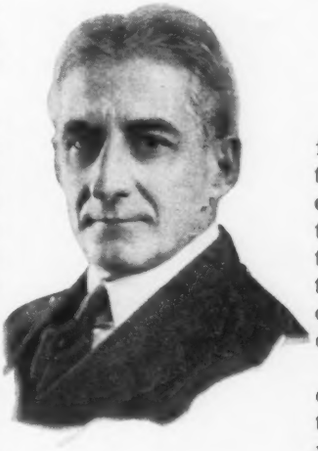
1. Do you expect increased business for electrical manufacturers in 1932?
2. Upon what changes do you expect business improvement to depend?
3. Do you believe it possible for business to organize itself for more stable conditions in sales and unemployment?
4. In what markets do you believe the greatest opportunities exist for sales of electrical products?
5. What co-operative effort by the industry to develop markets do you believe advisable?

B. W. Kerr

1. For becoming prophetic, I can't imagine a poorer year. The most notable single characteristic of today is that all previous signs have failed and it is purely a question of who makes the lucky guess.

2. Next year, and for several succeeding years, I feel the biggest field for the electrical manufacturing business is in devices for the home—refrigerators, ranges, hot water heaters, conditioned air. All of these are proving a vast field for the ingenuity of designers and the ability of the salesmen. It is difficult to estimate the value of this business to apparatus manufacturers. Their increase will come only as the load is built up. This load must be building up at an enormous rate because, in the face of the marked decrease in industrial power consumption, the total kilowatt-hour load has been almost maintained at last year's level.

3. There is no question but what business can organize itself more properly for stable conditions in sales and unemployment. I believe this to be a function of the individual companies themselves working through trade associations which provide studies of market conditions and market trends. We have all learned the lesson of conservative production and low inventories. We have all felt the grief caused by unemployment. Numerous plans have been suggested, all of which show defects. The only plan to succeed will have to be worked out by experience from this miscellaneous assortment.



Gerard Swope

4. A closer co-operation between the utilities and the manufacturers is absolutely essential. Such a glaring disregard of the contribution of the manufacturers to the industry as was shown at the last N.E.L.A. convention must not be repeated. The great disregard for the time and expense called for at this exhibit has certainly greatly discouraged the manufacturers in their efforts to further this co-operation. The manufacturers as well as the utilities are vitally interested in the production of uninterrupted kilowatts, and the designs of the manufacturers are, in a large measure, responsible for the reliability and efficiency of the operating systems today.

B. W. KERR,
President
Railway & Industrial Engineering Company.

The electrical industry is in a peculiarly fortunate position, for even in the past year there has been an increased consumption of electricity in the homes, mainly because of the installation of a greater variety of electrical appliances. In this year, also, industrial companies have modernized their productive methods, requiring new applications of electricity.

The Pennsylvania Railroad has embarked on a great program of electrification, and this undoubtedly will be followed by others, where density of traffic, the convenience of the traveling public and economic considera-

tions show that a change to electric operation is advantageous.

Because these things have been true in such a poor year as 1931, we look forward to 1932 and the succeeding years with confidence. We think that conditions in our country in 1932 should be at least as good as in 1931, after which we can look forward to a gradual increase in the electrical manufacturing business.

GERARD SWOPE,
President General Electric Company.

F. A. Merrick

Any one wishing to forecast the future of industry at this time has only one item of speculation to deal with, namely, when the upturn in the business world may come.

This, however, is the one point on which very few aspire to prophesy. There are too many uncertain factors—uncertain in their measure because they have not been present in the same way in former business recessions. Never before has the world been so generally closely knitted together in its economic life. Never before has ownership of the world's property, represented by securities of all kinds, been so widely distributed. Never before has speculation in these securities been so universal, and never before have so many people been led to look to speculative gains as a reliable provision of living expenses.

These things grew naturally out of the war period and its aftermath of post-war expansion—the boom period which had its closing chapters in 1929. Supply and demand in the economic world became unbalanced—every source of supply was built up to the utmost during the war period and the stimulation was continued through the period of reconstruction. When those countries which had been only consumers throughout these periods became again producers output was piled on output, and the utter disorganization of interchange which is still with us made itself evident.

The operation of these processes could not help but leave a deeply significant imprint on the credit situation of the world, and the international political complications that are interwoven with the situation, which are still far from solution, aggravate the result.

Thus, we have the uncertainty of when the turn will come, but, on the other hand, we have the certainty that the turn will come. We have, likewise, the certainty that the period of stress through which we are passing is laying the foundation for greater and sounder progress in the future. Industry must recognize this as a period of wholesome reconstruction. Those who first recognize the situation in this light will be the ones who will profit most largely. They will profit in the way of better returns from the actual business of the immediate present, and still more largely from the better business which is surely coming in the future, when the efficiency and strength developed in making ends meet under adverse conditions can be applied to serving the enormous needs of this country and of the world when the dammed-up buying power is released.

Present lines of product are being revamped, new and useful lines are being sought out, research is busy, manufacturing processes are being refined for higher quality and reduced costs, distribution means and methods are being analyzed, markets, both present and possible for development, are under close study. Industry will come out of the depression more fundamentally organized than ever before. This is the only way out. No nostrums will serve.

The electrical industry is especially typical in this respect—possibly more than typical because of the great fields of adaptability still in view ahead. Electrical industry is fortunate in that its service is a foundation stone of every industrial structure. Electricity serves every individual of the modern community—in his home, in his travels, in the manufacture of every article which he uses, in the transport of these articles, in turning the hours of darkness into light, in furnishing heat, in aiding the searches after health—in fact, in universal service.

The guarantee is obvious for a continued and increasing opportunity for business in the field of the service of electricity to these manifold uses as well as the broad field of manufacture of electrical apparatus requisite in the application of this service. The diversity factor is unparalleled as to both.

The position of these industries is unquestioned and their growth is to be measured only by the assuredly returning prosperity of the relatively near future.

F. A. MERRICK,
President Westinghouse Electric & Manufacturing Company.

C. L. Matthews

My opinion is that 1932 will be a better year for us than 1931 has been, and yet 1931 hasn't been a bad year for us, if we forget 1928 and 1929.

I think that one reason why some companies have suffered more than others during the past two years is that they have been waiting for 1928 and 1929 to come back and they are just beginning to realize that "them days is gone forever."

By the middle of 1930 we came to the above-mentioned conclusion and started in to improve all of our popular products and at the same time to reduce their costs and prices. We felt sure that the utilities would be the least affected by a prolonged depression in general business, and as most of them were in excellent financial condition that

they would use their money to improve and cut the cost of their distribution to householders and farmers. They would take advantage of lowered prices of copper, poles, crossarms, insulators, hardware, etc. This would result in a lot of business for a manufacturer who made products that would reduce distribution costs.

This meant day and night work in our engineering and development departments, changes in sales policies, the addition of salesmen and the addition of a number of new products.

The results for 1931 have been very gratifying. In 1932 the full effects of the changes and additions made in 1931 will be felt. That is why we believe that in so far as our business is concerned 1932 is going to be a good year.

CLAUDE L. MATTHEWS,
Vice-President W. N. Matthews Corporation.

A. W. Robertson

Surveying broadly the business outlook for 1932, it seems to me that the plans and economic forces now at work all tend toward early stabilization.

In any industry, and particularly in times of depression, there is usually an effort on the part of modern minded management to intensify promotion advertising and sales efforts in order to get its share of the going business. This is an entirely healthy and normal process in its general operation and, along these lines, we at Westinghouse propose to get our share of the current demand while waiting for a general upturn.

It is through this form of competition that the American public has been progressively supplied with better and cheaper merchandise and industry as a whole has been stimulated by this process to the point that it is today the wonder and envy of the civilized world.

Any opinion regarding the immediate future of the electrical manufacturing industry or in fact any industry must be highly qualified because at this writing there is no denying that current business is practically solely dependent on our ability to broaden our existing markets. Of course, there is a large volume of replacement business in sight but any large scale expansions in the electrical industry are at the moment remote. We propose by intensified sales and informative advertising efforts to stimulate the wider and more general use of electricity, electrical apparatus and electrical home conveniences.

There is plenty of good business in prospect, most of which is more or less contingent on general economic conditions. I personally believe that industrial leaders are slowly but surely massing their forces on a new frontier of business. I further believe that changes made, and in process, presage an entirely new economic alignment—simpler, surer, safer and flexible enough to meet the rapidly changing conditions in world business.

Otto H. Falk

H. W. Young

Nothing material has been destroyed. Our natural resources and national wealth are unimpaired. Money is very widely distributed as is attested by the statements of savings banks, insurance companies and other investment organizations.

American business leaders have had an illuminating experience and since the depression has lasted long enough to wash out all illusions, it is reasonable to assume that more scientific and more thorough analyses and research will be applied to all problems when and as they arise in the next few years. Our whole industrial and business structure is rapidly being whipped into sounder policies and practices. The process slowly forced upon most industries is now about accomplished. Business leaders having finished this job, are now looking upward and forward toward increasing business volume, and with constructive co-operation and leadership available, gradual but sure recovery of general business is extremely promising.

A. W. ROBERTSON,
Chairman of the Board
Westinghouse Electric & Manufacturing Company

1. It is doubtful that business will increase in 1932.
2. Improved world conditions and some restoration of confidence.
3. Yes.
4. In the United States.

OTTO H. FALK,
President Allis-Chalmers Manufacturing Company.

1. Yes. Due to efforts of utilities to increase current-consuming-device loads, which will, in turn, necessitate construction and installation of equipment to supply these loads.
2. Business will increase when our bankers realize that the United States is a better field to invest funds than going far afield to foreign countries.
3. Yes, but many of the plans now being put forward fail to consider fully the fact that, after all, the old-fashioned law of supply and demand must be taken into consideration.
4. A promising market is the application of electric heat for industrial products, such as galvanizing furnaces, heat treatment of metals, etc. Electric heat properly applied is very efficient and its effectiveness is seldom appreciated.
5. By real effort on the part of manufacturers and public utilities to sell their ideas to the public. As a matter of fact, many electrical men themselves are not as yet fully sold on the use of electricity in their own homes and establishments; in short, they themselves are not completely sold on the electrical idea.

H. W. YOUNG,
President Delta-Star Electric Company

Outstanding Facts

Figures (*except as noted*) are on electric light and power industry for the year's operations or as of the end of each year.

	1912	1917	1922	1927	1928	1929	1930	[1]1931
Capital invested, aggregate ($1,000)	2,289,622	3,245,185	4,817,000	9,500,000	10,300,000	11,100,000	11,800,000	12,400,000
Securities sold ($1,000)	.....	.....	719,961	2,152,527	1,653,180	1,468,895	1,591,986	1,491,742
by investment houses ($1,000)	.....	.....	589,961	[3]1,889,000	[3]1,471,498	[3]1,315,459	[3]1,452,854	[3]1,341,742
direct to customers ($1,000)	.....	.....	130,000	263,527	181,682	153,436	139,132	150,000
REVENUE, total gross ($1,000)	302,116	526,894	1,072,120	1,963,664	.....	.....	.....	.....
for electric service ($1,000)	[4]286,981	[4]502,060	[4]1,020,439	1,802,655	1,941,955	2,105,900	2,151,150	2,137,490
domestic ($1,000)	221,200	402,263	842,566	523,689	571,620	618,799	664,441	695,100
small light and power ($1,000)				482,136	519,957	555,640	575,598	568,640
large light and power ($1,000)				519,074	549,989	613,171	590,992	553,600
municipal lighting and misc. ($1,000)	29,777	36,652	49,151	82,996	90,695	98,646	107,841	110,300
railroads and railways ($1,000)	31,020	53,524	48,444	53,137	52,048	52,264	52,083	49,560
other utilities ($1,000)			75,011	141,623	157,646	167,380	160,195	160,290
from other sources ($1,000)	15,135	24,834	51,681	161,009	.....	.....	.....	.....
EXPENDITURES								
Additions and extensions ($1,000)	.....	.....	324,016	760,353	786,977	866,344	960,190	633,415
Operating, total[2] ($1,000)	151,270	308,214	533,068	828,168	866,350	934,890	946,180	920,300
Salaries, average ($ per year)	771	902	1,409	1,561	.....	.....	.....	.....
Officers	1,760	2,211	3,287					
Superintendents and managers	1,353	1,662	2,415	[7]1,735	.....	.....	.....	.....
Clerks	731	825	1,344					
Wage earners	692	833	1,312	[7]1,450	.....	.....	.....	.....
ENERGY (1,000,000 kw.-hr.)								
Output, all public utilities	.....	.....	47,659	80,205	87,850	97,352	95,936	91,700
Generated in central stations only	11,569	25,438	43,560	74,686	82,927	91,421	89,952	86,679
from fuel	.....	.....	26,573	45,968	49,419	59,031	59,388	58,296
from water power	.....	.....	16,987	28,718	33,508	32,390	30,562	28,382
Total; incl. imported and purchased	11,569	26,663	44,422	76,369	83,394	92,757	91,957	88,428
SYSTEMS, STATIONS, RATINGS, ETC.								
Number of establishments	5,221	6,542	6,355	4,355	4,063	[8]2,801	[8]2,755	[8]2,596
Commercial establishments	3,659	4,224	3,774	2,137	2,153	[8]1,480	[8]1,379	[8]1,308
Municipal establishments	2,581	2,318	2,581	2,198	1,910	[8]1,321	[8]1,376	[8]1,288
Companies generating	4,714	5,124	4,389	2,331	2,394	[8]1,699	[8]1,575	[8]1,686
purchasing all energy	507	1,418	1,966	2,004	1,669	[8]1,102	[8]1,180	[9]910
Operating systems with 100,000,000 kw.-hr. output	.....	.....	6	124	135	137	142	.....
Generating plants, total central station	5,221	6,542	5,444	4,801	4,352	4,250	3,873	[8]2,635
Commercial	3,659	4,224	3,615	3,589	3,232	3,190	2,863	.....
Municipal	1,562	2,318	1,820	1,207	1,120	1,060	1,010	.....
Generator rating (kw.)	5,165,439	8,994,407	14,313,438	25,811,305	27,698,305	29,558,637	31,949,919	32,922,311
Prime movers (hp.)	7,530,044	12,936,755	20,296,235	35,710,128	38,544,800	41,551,800	44,747,000	46,282,000
Steam engines and turbines (hp.)	4,949,778	8,449,076	14,171,222	25,317,577	27,360,000	29,512,000	31,540,000	32,450,000
Water wheels (hp.)	2,469,231	4,277,273	5,822,018	9,844,263	11,119,800	11,439,000	12,540,000	13,150,000
Internal combustion engines (hp.)	111,035	210,406	302,995	548,288	575,000	600,000	667,000	682,000
Water power, all uses (hp.)	4,770,000	6,800,000	8,270,000	12,296,000	13,571,530	13,807,778	14,884,667	15,520,000
Transmission (circuit miles)	.....	.....	86,290	185,449	†204,000	†225,000	†245,000	[9]210,000
Employees, total	79,335	105,541	150,762	251,020	†265,000	†289,000	301,000	†285,000
FUEL CONSUMPTION								
Coal and coke (short tons)	.....	21,565,273	26,130,865	37,500,630	37,593,322	41,406,000	39,702,000	36,319,000
Oil (bbl.)	.....	6,158,219	11,855,969	7,145,798	6,852,352	9,740,000	8,950,000	7,772,000
Gas (1,000 cu.ft.)	.....	14,199,204	20,174,385	65,522,792	77,054,261	112,442,000	119,457,000	135,085,000
ENERGY DISPOSITION (1,000,000 kw.-hr.)								
Sales, domestic	2,572	4,530	9,560	7,676	8,619	9,773	11,018	11,868
small power and light				10,766	11,692	13,106	13,944	13,956
large power and light	3,254	12,560	20,620	35,263	38,903	44,326	41,621	38,106
municipal lighting and misc.	([6])	([6])	([6])	2,003	2,223	2,450	2,735	2,781
railways and railroads	3,017	4,400	5,642	5,543	5,551	5,640	5,588	5,312
to company railway depts.	.....	.....	.....	1,348	1,330	1,279	1,184	1,050
company use and losses	2,546	5,140	8,600	13,770	15,077	16,184	15,867	15,355
CUSTOMERS								
Total number	3,837,518	7,178,703	12,709,868	21,786,212	23,153,252	24,147,183	24,555,732	24,675,835
Domestic lighting	3,100,918	5,810,300	10,211,232	17,950,934	19,089,882	19,967,154	20,331,551	20,441,289
Commercial lighting	605,600	1,125,200	2,030,324	3,358,140	3,532,489	3,598,115	3,628,653	3,612,827
Industrial power and other	131,000	243,203	468,312	477,138	530,881	581,914	595,528	621,714
People in electric lighted homes	14,000,000	25,250,000	43,100,000	75,500,000	80,300,000	84,000,000	84,700,000	85,500,000
Per cent of total population	15.9	24.3	38.9	63.0	67.5	70.0	70.0	70.0

†Estimated, based on past growth or known plans.
[1]Estimated, generally on ten months' operations.
[2]Does not include interest, taxes, depreciation or sinking fund.
[3]Includes rights.
[4]Includes estimated value of free service, not tabulated below.
[6]Included in "lighting."
[7]Commercial companies only
[8]Very small ones omitted, est 600 private, 400 municipa
[9]11,000 volts or over.

Stability in Manufacturing

By JOHN H. TRUMBULL
President National Electrical Manufacturers' Association

I DO NOT believe this is a time to make predictions. Yet one would be a coward indeed who did not look forward to a continuation of the developments that have made this country. I have the utmost confidence that we will work and bring back the confidence and the growth inherent in our nation. Just now we should follow the advice of Mr. Edison and be courageous and work hard.

Especially in the electrical industry is this true. In the homes and factories there are large opportunities now existing for increased business. Inventive genius is still at work bringing out new products and services. Prosperity for electrical men and women is largely a matter of their own will and action and independent of the variations in national business. We will get what we earn.

But conditions have changed in business and new conceptions of business have come about by the experience lessons we have taken in recent times. There is need for each business to readjust itself to these changed conditions and thus take advantage of the lessons learned. One of these lessons is the fact that a single enterprise cannot stand alone. In addition to the free play of initiative in its internal affairs it must apply its initiative to co-operate with competing and associated enterprises if prosperity and stability are to be maintained. Another lesson accents the value of human relations and necessitates greater practical intimacy between capital and labor so that the shocks of unemployment are withstood more resiliently.

Group action is the key to a more stable industry. Granted that each enterprise applies its full talents to new conceptions for production, organization and sales, it does not fulfill its responsibility until it participates in co-operative movements. And the practical organization for making co-operation effective is the trade association. Moreover, even though the trade association is not grown to full power, it has proved its value and its necessity. For example, electrical manufacturers grant that N.E.M.A. has been a powerful influence for stability in this depression period. Manufacturers in competing lines came to know each other intimately, they became informed about markets and production and they grew group conscious. These tangible and intangible benefits increased year after year, and as a result the manufacturers faced the depression with courage. They resorted to no unwise trade or price practices and held stable under low levels of business. They did more, they developed the thought that came to fruition in the Swope plan for industry stability.

Accurate surveys of opinion and careful studies of the Swope plan lead me to believe that it can be developed and applied by electrical manufacturers under present conditions. No legislation is needed to start operations in the early stages. I believe the electrical manufacturers should attempt to apply this plan as soon as possible. It must be in the public interest and receive public favor to endure, and if it achieves this standing, then any legislation necessary to its full accomplishment can be had with little difficulty. And the trade association is the agency that is necessary to make the plan operative. To do this there must be greater power, responsibility and initiative in the trade association while still safeguarding the freedom and initiative of individual members.

Stability through voluntary action

In my opinion the unemployment features of the Swope plan can be developed quickly and applied with modifications to suit individual enterprises. With respect to the production control aspects of the plan I believe the starting point is to form industry budgets through co-operative action. Once knowledge is had of booking, inventories and sales by lines or products for all industry, then the individual manufacturer can measure his accomplishments and check any unstable tendencies. Statistics to the trade association and the organization of a clearing house department of the trade association can readily develop this governor for business. Other useful and needed operations or facts can be introduced and applied as the plan develops and proves its value in use. I believe each electrical manufacturer should co-operate in this trial effort to make a new and constructive contribution in the public interest. It can be done voluntarily and wholeheartedly by co-operative effort.

I may be an optimist. Yet long experience teaches me to have faith in the courage and initiative of our people and in the business structure they have built. I believe that we will strengthen and benefit our civilization if we will turn to and do the things that lie ready to our hands. We can bring about better business and we can make business stable if we will.

The Electric Light and Power Industry in 1931

By J. F. OWENS

President National Electric Light Association

THE indispensable nature of the service rendered to the public by the electric light and power industry has once again been demonstrated during the year 1931. Although there has been some decline in the demand for traction and industrial power, other classes of service have held their own and the domestic load has established a new high record.

During 1931 the number of new consumers has increased by about 120,000, more than 2,000,000 hp. of plant capacity has been placed in service and the use of electricity in the homes and farms of the country has shown a gain of 8 per cent. Properties have been maintained in excellent operating condition and all regions of the United States have seen the further extension of distribution lines into districts hitherto without service.

Domestic service shows steady growth

Domestic use of electricity has shown few indications of being affected by the depression. While there have, of course, been many small economies practiced by individual consumers in the use of lights and small appliances, more electricity has been used in the homes owing to the continuous increase in the number of ranges, refrigerators and water heaters in use.

Total sales of domestic electric service fell but little short of 12,000,000,000 kw.-hr. during 1931, an increase of about 8 per cent over the previous year and a figure larger than the entire sales of electricity for all purposes only twenty years ago.

The utilization of electricity by the average household consumer increased from 548 kw.-hr. at the end of 1930 to 580 kw.-hr. at the close of 1931, while at the same time the average price declined from 6.03 cents per kilowatt-hour to 5.80 cents—a drop of almost 4 per cent. The consumer has thus obtained nearly 6 per cent more service for slightly more than the same expenditure of money. The effects of promotional rates and of further reductions have been very evident during the year and the over-all average price of all domestic service throughout the nation now stands at 32 per cent below the pre-war level, while the cost of living still remains 50 per cent above.

New construction continues

Long-range projects were carried on largely as planned throughout the greater part of 1931. Approximately 2,000,000 hp. of additional generating equipment went into operation during the year, bringing the total capacity of all public utility enterprises of the country (including traction systems) to practically 50,000,000 hp. In only eight years the electric generating capacity of the United States has doubled.

Thousands of miles of additional transmission and distribution lines have been placed in operation, so that service is now available to practically every town of more than 1,000 people and 70 per cent of the population of the United States now live in electrically lighted homes.

Conspicuous among the year's construction are the large hydro-electric plants now coming into service as the result of plans conceived some years ago and occupying several years of continuous construction. Safe Harbor, Bagnell, Rock Island and the various other great developments in many parts of the country emphasize the unimpaired confidence of the electric light and power industry in the future of its business.

New records in operating efficiency

The year 1931 was marked by the continuance of inadequate rainfall over many sections of the country. In California, parts of the Northwest and throughout the South the effects of the water shortage were particularly severe and once more emphasized the importance of large-scale interconnection and the necessity of fuel-burning plants for safeguarding adequate and reliable service. The production of hydro-electric power declined nearly 10 per cent below the figures for 1930 and during the late summer and fall many plants established new

low records. In November, for instance, it became necessary to go back to 1925 before a similar figure for water-power production could be found.

It is to the credit of the electric light and power industry that its steam stations were once again fully adequate to meet the existing loads in all parts of the country and no utility customers were inconvenienced by this shortage of water.

Despite the prevailing depression, the production of electricity by steam thus decreased by barely 2 per cent from the previous year and fuel-burning plants produced a larger proportion of the total electrical supply than ever before. Operating efficiencies showed further improvements. While production declined by 2 per cent, there was a decrease of nearly 6 per cent in the amount of fuel used, with the result that the calorific efficiency of the steam power plants, as expressed by pounds of coal per kilowatt-hour generated, established a new record at 1.56 lb. This compares with 1.62 lb. in 1930 and is less than one-half the figure of only twelve years ago.

As pointed out by the Federal Power Commission in its last report, "no other great industry exhibits a like resistance to the general economic influence of this period," in so far as the revenues from consumers of service are concerned and, I might also add, in so far as net income available for investors is also concerned. Gross revenues from consumers during 1931 will show a decrease of less than 1 per cent from the total of the previous year and, even allowing for further increases in the burden of taxation, net income will probably show a satisfactory figure compared with the record figure of the year before for the electric light and power industry as a whole. Inasmuch as millions of consumers are also investors, the industry's capacity for resistance to general economic influences is doubly important.

The determination of the utilities, the manufacturers and the dealers to repeat next year the splendid performance of the 1931 electric refrigerator campaign and the institution of further campaigns for ranges and other domestic appliances promises well for the continuation of the growth of domestic electric service throughout 1932. Such growth, which increases the use of electricity, has been and will continue to be the principal factor in reducing the cost of service to the consumer. The adaptation of electricity to the various uses on the farm is steadily progressing and it is of much hopeful significance for the future of the electric light and power industry, as well as of agriculture, that the use of electric current per farm is already considerably in excess of urban domestic requirements. Properties are in excellent physical condition and the resumption of industrial activity will find an immediate reflection in the output and revenues of the utility enterprises.

As counseled by Thomas A. Edison in his last public speech, the electric light and power industry looks forward with faith, goes forward with courage.

▼ ▼ ▼

2,200,000 Kw. in New Stations

GENERATING capacity installed during 1931 amounted to 1,403,000 kw. Of this 566,500 kw. were hydro generation and 836,500 in fuel-burning plants. The steam plants capacity consisted of 567,500 kw. in the form of additions to existing plants and 269,000 in new plants. The total evidences a pronounced drop from the 1930 fuel plant additions of over 2,000,000 kw.

Hydro held up better by comparison with the 1930 figure of almost 750,000 kw. The bulk of the hydro capacity increment lies in new stations, only 11,800 kw. having been added in existing plants. All regions except the South Atlantic States show new hydro stations. The Pacific States show the largest increment, 191,000 kw. Oil-burning plants account for 17,000 kw. of the total fuel plants additions; of this 14,000 kw. is in existing plants and 3,000 kw. in new plants.

New construction announced for 1932 comes to a total of 795,641 kw., as compared with the 1931 announcements of 2,106,600 kw. The contemplated or contracted

Power Plant Capacity Added During 1931

Steam-Electric Plants

Company	Station and Location	Added to Existing Plants, Kw.	New Plants Kw.
NEW ENGLAND STATES			
Cape & Vineyard Electric Co.	Vineyard Haven, Mass.	*460	.....
MIDDLE ATLANTIC STATES			
Buffalo General Electric Co.	Huntley (Buffalo)	80,000	.....
Freeport, L. I., N. Y., Village of	Freeport, N. Y.	*2,000	.....
Jamestown, N. Y., Municipal Electric Light Dept.	Jamestown, N. Y.	12,500	.....
EAST NORTH CENTRAL STATES			
The Cleveland Elec. Illumin'g Co.	Ashtabula (Ashtabula, Ohio)	50,000	.....
Edison Sault Electric Co.	St. Ignace, Mich.	*1,000	.....
Indianapolis Power & Light Co.	Harding St. Plant	.....	70,000
Lansing, Mich. (Municipal)	Lansing, Mich.	20,000	.....
Michigan Electric Power Co.	Lapeer, Mich.	500	.....
Northern Indiana Pub. Service Co.	Michigan City, Ind.	.....	68,000
Public Service Co. of No. Illinois	Waukegan Station, No. 6 (Waukegan, Ill.)	115,000	.....
Rockport Water Works Co.	Rockport, Ind.	750	.....
Willow River Power Co.	Hudson, Wis.	*600	.....
Wisconsin Power & Light Co.	Edgewater Plant (Sheboygan, Wis.)	.....	30,000
WEST NORTH CENTRAL STATES			
Fort Dodge Gas & Electric Co.	Fort Dodge, Iowa	5,000	.....
Highland Utilities Co.	Ulysses, Kansas	*200	.....
Iowa-Nebraska Light & Power Co.	Lincoln, Neb.	6,000	.....
Iowa Public Service Co.	Carroll, Iowa	*1,000	.....
Iowa Public Service Co.	Le Mars, Iowa	.....	*560

Company	Station and Location	Added Kw.	New Kw.
WEST NORTH CENTRAL STATES (Continued)			
Iowa Railway & Light Corp.	Boone, Iowa	1,000	.....
Iowa Railway & Light Corp.	Marion, Iowa	500	.....
Iowa Railway & Light Corp.	Nevada, Iowa	.....	*1,680
Iowa Southern Utilities Co.	Ottumwa, Iowa	10,000	.....
Kansas City, Kansas, Munic. Plant	Quindaro	10,000	.....
Laclede Power & Light Co.	St. Louis, Mo.	5,000	.....
Minnesota Power & Light Co.	Duluth, Minn.	.....	20,000
Missouri Service Co.	Tarkio, Mo.	*‡1,050	.....
Montana Dakota Power Co.	Williston, S. D.	.....	2,000
Northern States Power Co.	Riverside (Minneapolis, Minn.)	35,000	.....
Northwestern Light & Power Co.	Grundy Center, Iowa	.....	500
The Western Public Service Co.	Ogallala, Neb.	*‡1,050	.....
The Western Public Service Co.	Orleans, Neb.	.....	*‡1,050
The Western Public Service Co.	Sidney, Neb.	*‡1,200	.....
SOUTH ATLANTIC STATES			
Appalachian Electric Power Co.	Cabin Creek, W. Va.	5,000	.....
Potomac Electric Power Co.	Benning (Washington, D. C.)	30,000	.....
South Carolina Utilities Co.	Conway, S. C.	500	.....
Virginia Public Service Co.	Bremo, Va.	.....	30,000
EAST SOUTH CENTRAL STATES			
Alabama Utilities Co.	Andalusia, Ala.	*240	.....
Alabama Utilities Co.	Frisco City, Ala.	*160	.....
Kentucky-Tennessee Lt. & Pwr. Co.	Bowling Green, Ky.	.....	7,000
Ripley Utilities Co.	Ripley, Miss.	*200	.....
WEST SOUTH CENTRAL STATES			
Houston Lighting & Power Co.	Deepwater, Texas	47,000	.....
Southwestern Power Co.	Amarillo, Tex.	18,000	.....
Texas Power & Light Co.	Trinidad, Texas	35,000	.....
Texas Utilities Co.	Tuco, Tex.	7,500	.....
MOUNTAIN STATES			
Arizona General Utilities Co.	Safford, Ariz.	*428	.....
Logan City, Utah, Munic. Elec. Plt.	Logan, Utah	780	.....
Public Service Co. of Colorado	Sterling, Colo.	*2,000	.....
Tucson Gas, Elec. Lt. & Power Co.	Tucson, Ariz.	*(a) 4,000	.....
Tucumcari Light & Power Co.	Tucumcari, N. M.	*300	.....
PACIFIC STATES			
Eugene, Oregon, Munic. Elec. Plant	Eugene, Oregon	.....	6,000
Pacific Gas & Electric Co.	Station "A," San Francisco	66,000	.....
Tacoma, Wash., Light Division	Hylebos Waterway	.....	25,000

Hydro-Electric Plants

Company	Station and Location	Added Kw.	New Kw
NEW ENGLAND STATES			
Central Maine Power Co.	Wyman Dam (Bingham, Me.)	.....	48,000
Grafton Power Co.	McIndoes	.....	10,000
MIDDLE ATLANTIC STATES			
Beebee Island Corp.	near Watertown, N. Y.	.....	7,500
Safe Harbor Water Power Corp.	Development on Susquehanna River	.....	56,000
EAST NORTH CENTRAL STATES			
Baraga County Light & Power Co.	Houghton, Mich. (Sturgeon River)	.....	(a) 2,750
Consumers Power Co.	Hardy (Muskegon River)	.....	30,000
Edison Sault Electric Co.	Sault Ste Marie, Mich.	2,500	.....
WEST NORTH CENTRAL STATES			
Union Electric Light & Power Co.	Osage River (Bagnell, Mo.)	.....	129,000
SOUTH ATLANTIC STATES			
Appalachian Electric Power Co.	Reusens, Va.	8,000	.....
EAST SOUTH CENTRAL STATES			
The Tennessee Electric Power Co.	Blue Ridge (Occoee River)	.....	20,000
WEST SOUTH CENTRAL STATES			
Arkansas Power & Light Co.	Carpenter, Ark.	.....	56,000
Texas Power & Light Co.	Llano, Texas	.....	500
MOUNTAIN STATES			
U. S. Bureau of Reclamation	Shoshone (Wyo.)	.....	4,500
PACIFIC STATES			
Inland Power & Light Co.	Ariel, Wash.	.....	45,000
Pacific Gas & Electric Co.	Salt Springs	.....	11,000
Pacific Gas & Electric Co.	Tiger Creek	.....	60,000
Puget Sound Power & Light Co.	Rock Island (near Wenatchee, Wash.)	.....	15,000
So. California Edison Co., Ltd.	Borel	1,300	.....
Tacoma, Wash., Light Division	Potlach, Wash.	.....	60,000

Power Plant Capacity Scheduled to Be Completed in 1932

Steam-Electric Plants

Company	Station and Location	Added to Existing Plants, Kw.	New Plants Kw.
MIDDLE ATLANTIC STATES			
Brooklyn Edison Co., Inc.	Hudson Ave.	320,000	.....
Freeport, L. I., N. Y., Village of	Freeport, N. Y.	*‡3,000	.....
General Electric Co. (To be operated by New York Pwr. & Lt. Corp.)	Schenectady, N. Y.	.....	†25,000
Public Service Electric & Gas Co.	Burlington	18,000	.....
Public Service Electric & Gas Co.	Kearny	75,000	.....
Public Service Electric & Gas Co.	Kearny	†20,000	.....
EAST NORTH CENTRAL STATES			
The Detroit Edison Co.	Delray No. 3	50,000	.....
The Milwaukee Elec. Ry. & Lt. Co.	Port Washington (Port Washington, Wis.)	.....	80,000
Richmond, Ind., Municipal Electric Light & Power Co.	Richmond, Ind.	15,000	.....
WEST NORTH CENTRAL STATES			
Iowa Railway & Light Corp.	Toledo, Iowa	.....	*1,500
Kansas Power Co.	Dodge City, Kansas	.....	6,000
Otter Tail Power Co.	Kidder Station (Wahpeton, N. D.)	7,500	.....
Northwestern Public Service Co.	North Platte, Neb.	.....	3,000
Sioux City Gas & Electric Co.	Big Sioux (Sioux City, Iowa)	10,000	.....
The Western Public Service Co.	Chadron, Neb.	*‡1,500	.....
PACIFIC STATES			
Pasadena, Calif., Lt. & Pwr. Dept.	Pasadena, Calif.	25,000	.....
Los Angeles Gas & Electric Corp. (c)	Seal Beach	35,000	.....

Hydro-Electric Plants

MIDDLE ATLANTIC STATES			
Paul Smith's Electric Light & Power & Railroad Co.	Lake Placid, N. Y.	.....	375
Safe Harbor Water Power Corp.	Development on Susquehanna River	56,000	.....
Safe Harbor Water Power Corp. (c)	Development on Susquehanna River	56,000	.....
WEST SOUTH CENTRAL STATES			
Central Power & Light Co.	Eagle Pass, Texas	.....	9,000
MOUNTAIN STATES			
Rocky Mountain Power Co. (b)	Flathead, Montana	.....	112,000
U. S. Bureau of Reclamation	Grand Valley (Colo)	.....	3,000
PACIFIC STATES			
The California Oregon Power Co.	Prospect No. 3 (on Rogue River)	.....	7,200
Los Angeles, Calif., Dept. of Water & Power	San Francisquito Plant No. 2	‡20,500	.....
Puget Sound Power & Light Co.	Rock Island (near Wenatchee, Wash.)	45,000	.....
U. S. Bureau of Reclamation	Prosser (Wash.)	.....	(a) 3,000
Seattle, Wash., Dept. of Lighting (c)	Diablo (Skagit River)	.....	120,000

*Internal Combustion. †Mercury Vapor. ‡Horsepower. (a) Kilovolt-amperes. (b) 1932 or later. (c) Scheduled for 1933.

capacity embraces 136,641 kw. in hydro and 659,000 kw. in fuel plants, with the latter including 45,000 kw. of mercury turbine and 4,500 kw. of oil generation.

In steam the largest item of new capacity in 1931 was the 115,000 kw. at Waukegan, of the Public Service Company of Northern Illinois; next was the 80,000 kw. of the Buffalo General Electric Company. In water power the most prominent was the 129,000 kw. at the Union Electric Light and Power Company's plant on the Osage River; at Safe Harbor on the Susquehanna the initial 56,000 kw. is the forerunner of another 56,000 kw. to go in during 1932. Several large plants or units, from 45,000 kw. to 60,000 kw. each, went into operation on the West Coast.

For 1932 the largest single item is the 320,000 kw. in steam to be put into service by the Brooklyn Edison Company early in the year. There is planned also for 1933 a steam addition of 35,000 kw. at Seal Beach (Los Angeles Gas & Electric Company), 56,000 kw. more hydro at Safe Harbor, 120,000 kw. new hydro at Diablo (Seattle), and 112,000 kw. new hydro of the Rocky Mountain Power Company. Two installations involving mercury-turbine units are in preparation, also scheduled for 1932, one constituting an addition of 20,000 kw. at Kearney station of the Public Service Electric & Gas Company of New Jersey, the other, of 25,000 kw., at the Schenectady plant of the General Electric Company, to be operated by the New York Power & Light Company, 323,000 kw. is scheduled for 1931.

Manifestly the trend of power plant growth has been disrupted by the uncertainty in the business arena. Additional generation provided is down to half the figures for the previous year and the prospective additions for which commitments have been made or are being made are only a little over a third of the previous year's planning. Until, therefore, the revived business conditions restore the rosy tint to the electrical demand picture it does not appear that the industry has the courage to invest in capacity which will match the growth in output potentiality indicated by past growth in consumption.

List of Power Projects Completed in 1931 or Under Construction Under License From Federal Power Commission as of November 1, 1931

Project No.	Name	Stream	State	Proposed Ultimate Installed Hp.	Estimated Cost	Scheduled Date of Completion	Horsepower Placed in Operation or Scheduled to be Put in Operation 1931	1932	1933	Remarks
5	Rocky Mountain Power Co.	Flathead River and Lake	Montana	150,000	$8,000,000	5-23-33	.....	.....	150,000	.....
77	Pacific Gas & Electric Co.	South Eel River	California	18,000	6,665,000	12-31-35	.....	.....	8,500	7,500 horsepower previously installed.
135	Portland General Electric Company	Clackamas River and Oak Grove Creek	Oregon	85,000	9,736,000	5-7 -36	50,000	.....	.....	35,000 horsepower previously installed. Cost includes 24 miles of railroad
137	Pacific Gas & Electric Co.	No. Fk. Mokelumne R.	California	85,500	17,980,000	12- 1-30	85,500	.....	.....	Includes 14.5 miles of transmission line.
271	Arkansas Pwr. & Light Co.	Ouachita River	Arkansas	96,000	8,055,000*	7- 1-36	12,000	.....	.....	12,000 horsepower previously installed. *Estimated cost of Carpeter development.
459	Union Electric Light and Power Co.	Osage River	Missouri	268,000	30,000,000	6—30-32	211,000	.....	.....	Cost includes transmission line.
553	City of Seattle	Skagit River	Washington	240,000	13,550,000	12-31-35	.....	.....	166,000	.....
669	Gates, Harry V.	Crooked River	Oregon	700	70,000	7- 2-32	.....	700	.....	.....
785	City of Allegan	Kalamazoo River	Michigan	3,000	485,000	6-30-32	.....	3,000	.....	.....
877	Feather River Trust	Dogwood Creek	California	40	8,000	10-31-32	.....	40	.....	Cost estimated at $200 per horsepower.
878	Baldwin, Anita M.	Fallen Leaf Lake	California	190	18,200	9- 1-33	.....	.....	190	.....
898	Hooper, J. L., M. C., and J. W.	Kern River	California	33	6,600	12-31-31	33	.....	.....	Cost estimated at $200 per horsepower.
910	Afton Electric Company	Swift Creek	Wyoming	135	22,353	10-31-31	135	.....	.....	.....
925	City of Ottumwa	Des Moines River	Iowa	4,200	479,000	4-11-33	4,200	.....	.....	.....
939	Inland Power & Light Co.	Lewis River	Washington	216,000	11,290,000	.....	.....	55,000	.....	.....
935	Shreve, A. L.	Berkshire Creek	Oregon	28	6,150	1- 1-32	.....	28	.....	Cost estimated at $220 per horsepower.
943	Puget Sound Pwr. & Lt. Co.	Columbia River	Washington	210,000	19,250,000	.....	.....	.....	84,000	.....
1025	Safe Harbor Water Power Corporation	Susquehanna River	Pennsylvania	510,000	30,231,000*	.....	.....	170,000	.....	*Estimated cost of initial installation.
1036	Greve, T. W.	Unnamed creek	Washington	10	2,500	1- 1-31	10	.....	.....	Cost estimated at $250 per horsepower.
1115	Wright, E. L.	Cinder Gap Creek	California	34	8,000	10-27-32	.....	34	.....	Cost estimated at $235 per horsepower.
1126	Odell Lake Company	Odell Creek	Oregon	40	9,000	7- 1—32	.....	40	.....	Cost estimated at $225 per horsepower.
1141	Blankenship, E. O.	Purple Creek	Washington	7	3,000	7- 1—32	7	.....	.....	.....
1163	The California Oregon Power Company	So. Fk. Rogue River	Oregon	10,000	900,000	1- 1-34	.....	10,000	.....	.....
1165	Green River Lake Lodge	Hobson Creek	Wyoming	5	1,250	1- 1-33	5	.....	.....	Cost estimated at $250 per horsepower.

Capacity of Generators in Public Utility Power Plants*

November, 1931—United States Geological Survey

				Generator Capacity in Kilowatts of Plants Operated By									
				One Type of Prime Mover						Combination of Two or More Types			
	Companies†	Plants	Total Capacity Kw.	Water Power		Steam Power		Internal Combustion Engines			Kw. Total	Water Power	Steam Power	Int. Comb. Engines
				No.	Kw.	No.	Kw.	No.	Kw.	No.				
UNITED STATES	1,578	3,912	35,086,188	1,346	9,142,327	1,484	24,664,719	804	344,041	278	935,101	276,423	565,651	93,027
New England	149	333	2,937,196	213	786,404	83	2,014,520	6	4,082	31	132,190	20,931	108,960	2,299
Middle Atlantic	157	430	8,637,901	202	1,228,482	182	7,226,340	21	19,177	25	163,902	125,070	36,590	2,242
East North Central	311	690	8,090,539	262	617,446	353	7,236,376	34	18,484	41	218,233	20,417	189,158	8,658
West North Central	363	733	2,623,782	107	459,495	279	1,916,825	276	114,246	71	133,216	12,236	91,852	29,128
South Atlantic	176	466	4,362,975	154	1,839,756	184	2,332,722	99	42,060	29	148,437	59,694	82,349	6,394
East South Central	79	215	1,705,860	34	924,725	99	717,934	68	19,668	14	43,533	23,615	17,152	2,766
West South Central	133	439	1,677,623	15	18,835	154	1,505,431	244	100,960	26	52,397	1,080	31,979	19,338
Mountain	132	313	1,145,597	157	775,556	83	316,774	44	17,255	29	36,012	9,220	5,881	20,911
Pacific	78	293	3,904,715	202	2,491,628	67	1,397,797	12	8,109	12	7,181	4,160	1,730	1,291
NEW ENGLAND														
Maine	29	78	261,297	66	208,425	6	49,730	1	557	5	2,585	1,446	740	399
New Hampshire	15	53	285,888	38	218,313	6	41,955	1	480	8	25,140	4,150	20,050	940
Vermont	25	71	178,841	61	163,181	4	11,200	0	0	6	4,460	1,750	2,710	0
Massachusetts	53	83	1,344,265	26	117,390	46	1,149,575	3	2,565	8	74,735	10,905	62,870	960
Rhode Island	4	7	242,950	3	1,750	4	241,200	0	0	0	0	0	0	0
Connecticut	23	41	623,955	19	77,345	17	520,860	1	480	4	25,270	2,680	22,590	0
MIDDLE ATLANTIC														
New York	81	256	5,067,840	164	1,123,862	74	3,924,145	5	8,408	13	11,425	6,255	4,035	1,135
New Jersey	13	29	978,565	4	1,100	21	968,425	2	1,740	2	7,300	5,100	2,200	0
Pennsylvania	63	145	2,591,496	34	103,520	87	2,333,770	14	9,029	10	145,177	113,715	30,355	1,107
EAST NORTH CENTRAL														
Ohio	67	106	2,265,007	8	10,380	88	2,183,822	5	1,060	5	69,745	2,695	66,700	350
Indiana	57	109	1,059,927	18	32,170	83	1,017,490	6	3,592	2	6,675	3,200	3,260	215
Illinois	60	113	2,334,819	15	45,500	85	2,202,409	8	4,085	5	82,825	5,535	76,555	735
Michigan	62	178	1,605,096	112	289,140	47	1,298,120	9	3,366	10	14,470	1,910	7,283	5,275
Wisconsin	65	184	825,690	109	240,256	50	534,535	6	6,381	19	44,518	7,077	35,358	2,083
WEST NORTH CENTRAL														
Minnesota	60	120	570,318	39	146,990	56	407,449	12	5,491	13	10,388	2,430	4,874	3,084
Iowa	66	145	577,739	26	146,600	71	345,683	34	17,462	14	67,994	3,903	57,841	6,250
Missouri	61	108	750,201	7	149,105	48	574,977	46	21,619	7	4,500	0	1,810	2,690
North Dakota	14	34	57,191	0	0	18	52,770	15	3,871	1	550	0	250	300
South Dakota	24	53	61,322	5	4,200	14	36,118	31	9,919	3	11,085	0	9,030	2,055
Nebraska	65	143	232,755	23	6,785	39	186,165	60	18,861	21	20,944	3,936	8,428	8,580
Kansas	73	130	374,256	7	5,815	33	313,663	78	37,023	12	17,755	1,967	9,619	6,169
SOUTH ATLANTIC														
Delaware	7	7	32,265	0	0	5	31,350	2	915	0	0	0	0	0
Maryland	15	27	619,607	3	252,780	15	344,970	8	2,597	1	19,260	19,200	0	60
Dist. of Columbia	3	3	228,900	1	2,400	2	226,500	0	0	0	0	0	0	0
Virginia	29	83	466,712	36	82,159	24	299,514	15	4,528	8	80,511	14,053	65,790	668
West Virginia	19	45	560,059	7	55,970	26	499,460	9	4,237	3	392	135	62	195
North Carolina	32	86	993,475	51	642,140	23	337,695	8	4,239	4	9,401	6,126	2,000	1,275
South Carolina	19	48	686,473	23	522,355	19	141,001	2	190	4	22,927	16,200	6,397	330
Georgia	18	74	407,571	30	267,702	34	130,554	8	1,835	2	7,480	3,780	3,500	200
Florida	34	93	367,913	3	14,250	36	321,678	47	23,519	7	8,466	200	4,600	3,666
EAST SOUTH CENTRAL														
Kentucky	19	50	344,022	3	104,860	35	236,017	6	1,005	6	2,140	315	975	850
Tennessee	28	57	416,920	20	184,815	24	190,832	10	2,341	3	38,932	23,100	15,240	592
Alabama	11	41	885,166	11	635,050	16	245,475	13	4,201	1	440	200	240	0
Mississippi	21	67	59,752	0	0	24	45,610	39	12,121	4	2,021	0	697	1,324
WEST SOUTH CENTRAL														
Arkansas	19	78	93,934	4	10,855	42	74,581	29	5,254	3	3,244	0	1,134	2,110
Louisiana	26	54	267,192	0	0	12	246,940	39	15,990	3	4,262	0	2,712	1,550
Oklahoma	45	98	333,935	2	1,500	36	300,988	54	27,660	6	3,787	200	1,117	2,470
Texas	43	209	982,562	9	6,480	64	882,922	122	52,056	14	41,104	880	27,016	13,208
MOUNTAIN														
Montana	9	31	310,931	18	300,014	7	7,863	3	1,314	3	1,740	400	375	965
Idaho	19	47	228,600	40	221,780	4	2,250	0	0	3	4,570	3,800	0	770
Wyoming	20	35	48,067	8	11,580	16	32,435	9	3,060	2	992	400	472	120
Colorado	30	65	226,370	22	51,017	34	170,275	4	1,913	5	3,165	1,750	600	815
New Mexico	15	27	41,792	0	0	12	32,161	10	5,431	5	4,200	989	1,545	1,666
Arizona	16	41	139,155	11	87,050	9	30,790	15	4,072	6	17,243	0	2,539	14,704
Utah	19	57	140,130	52	95,490	1	41,000	1	465	3	3,175	1,740	0	1,435
Nevada	4	10	10,552	6	8,625	0	0	2	1,000	2	927	141	350	436
PACIFIC														
Washington	29	77	813,727	48	624,685	21	184,907	1	48	7	4,087	2,166	970	951
Oregon	23	67	333,361	39	166,530	17	161,890	6	1,847	5	3,094	1,994	760	340
California	26	149	2,757,627	115	1,700,413	29	1,051,000	5	6,214	0	0	0	0	0

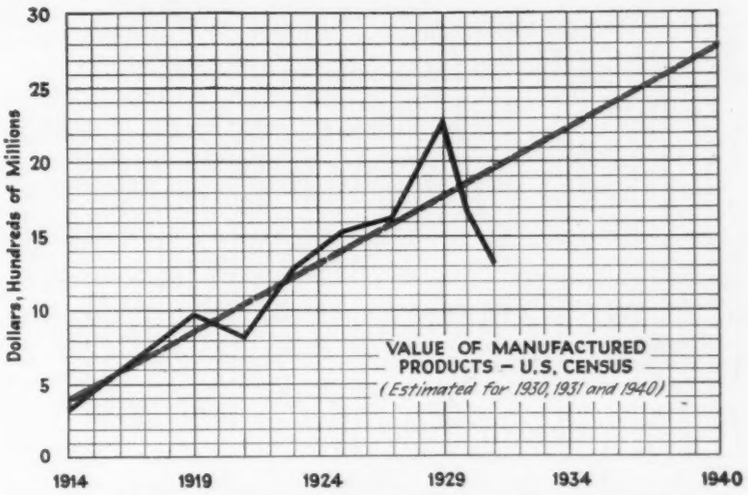
*The table relates to all public utility plants of 100 kw. or larger. This is a more comprehensive classification than electric light and power; it embraces also electric railway and other plants generating energy used for public utility purposes.

The omission of the very small plants does not appreciably affect the aggregate rating or output. In 1927 there were about 1,000; the number tends to decrease. The omission correspondingly affects the number of operating companies or establishments. This approaches the number of plants, since the latter usually serve isolated villages and hamlets, and are owned singly either by local companies or by the municipalities.

†Only companies that nave generating plants. Excludes those purchasing all their energy. Includes municipalities.

Product Sales Off 22 per Cent

Power equipment least active.
Refrigerator leads appliances.
Prospects for improvement.
Ranges in favor.
Manufacturers hold firm.



Sales value of electrical products drops rapidly

ACCORDING to the U. S. Census electrical manufacturers sold products at their factories in 1929 of a total value of $2,286,273,000. These are strictly classified products only and omit built-in electrical apparatus, electroplating, fixtures and many products made to go with electrical equipment. This high mark of 1929 has been decreasing steadily. In 1930 the corresponding estimate is $1,691,000,000 and 1931 saw a further drop to an estimated total of $1,314,000,000—a 42 per cent decrease in two years. This is a 1923 level of business and actual conditions at the beginning of 1932 promise little, if any, change in conditions in the near future.

It is a credit to the leadership of the electrical manufacturers that this great and sudden change in business volume has created little, if any, instability in the industry. Their credit is good, very few failures have occurred, prices are held stable and their courage is high. They entered the depression with very low inventories and splendid balance sheets as regards plant fixed charges and surplus funds. They held together in their associations and saw the fallacy of disrupting the market by price cutting and dumping. In some appliances and power accessories aggressive selling brought increased business and the great decrease in the sale of power equipment to utilities and industrials was partially offset by sales of other equipment.

A close scrutiny of operating expenses, reorganization for production and sales, elimination of overhead and care to adjust unemployment to cause least suffering were constructive steps taken by manufacturers. The Swope plan is a typical example of the grade of thought and action that has held electrical manufacturers sound and stable in a trying period.

Reports from many manufacturers indicate that business plans for 1932 are made on the basis of 1931 conditions. Little, if any, change is expected in total volume and first quarter low levels must increase in the last quarters if 1931 volume is to be had. The year opens with about the lowest level in orders booked since 1929 and factory production is also at a similar low level. But, on the other hand, close observation of utility and industrial markets indicates that buying will be necessary soon. Storerooms are empty, slow but steady general growth is evident in many sections, competition is keener, and this will force modernization in factories; consumer goods are moving and general business, judged by the past, is ready for a slow-up-turn. This should reflect itself in better business for electrical manufacturers as the year passes.

In addition, it may be noted that the electrical industry is independent of national business conditions to a very large extent. It has large unsaturated markets at present business levels and it can, therefore, make its own levels of business prosperity.

Estimated Sales of Electrical Products—1931

A.C. motors, 1 to 200 hp...	$57,000,000	Traction apparatus.....	$35,000,000
Power transformers.....	18,000,000	Electric meters.....	10,500,000
Distribution transformers	18,000,000	Steam turbo-generators...	5,800,000
Oil circuit breakers.....	8,500,000	Fractional-hp. motors....	43,000,000
Panel switchboards.....	7,000,000	Synchronous condensers..	1,500,000
Metal-clad switchgear....	4,000,000	Induction regulators.....	2,500,000
Control apparatus.....	34,000,000	Waterwheel generators...	7,500,000

An instance of this is found in electric refrigerators. Some 1,000,000 units at a factory value of $160,000,000 were sold in 1931 despite the depression—a 25 per cent increase over 1930. This same effect could have been had five or ten years ago had the industry gone after the business. A similar history will follow the active effort to sell electric ranges in 1932. This product has been perfected many years, but it has never been sold intelligently. Air conditioning, house heating, industrial power

Growth in Electrical Manufacturing

(U. S. Census 1930–1931 Estimated)

Year	Number of Companies	Number of Employees	Wages	Cost of Raw Materials	Value of Products	Value Added by Manufacture	Horsepower Used
1914	1,030	262,000	$109,000,000	$154,000,100	$335,000,000	$180,442,000	226,000
1919	1,404	212,374	238,188,852	425,000,000	997,968,119	572,869,908	438,000
1921	1,333	161,204	194,242,347	344,069,963	833,985,443	489,915,480	.....
1923	1,671	234,892	305,455,263	548,626,673	1,293,001,771	744,375,098	480,268
1925	1,739	339,921	323,834,541	636,692,076	1,540,307,035	903,309,965	589,398
1927	1,777	241,566	336,238,750	745,761,699	1,637,307,035	991,545,336	661,168
1929	1,798	329,361	455,294,638	921,190,963	2,286,273,042	1,365,082,079	.....
1930	.....	.....	.....	.....	1,691,000,000	.....	.....
1931	.....	.....	.....	.....	1,314,000,000	.....	.....

Classified Electrical Equipment Growth

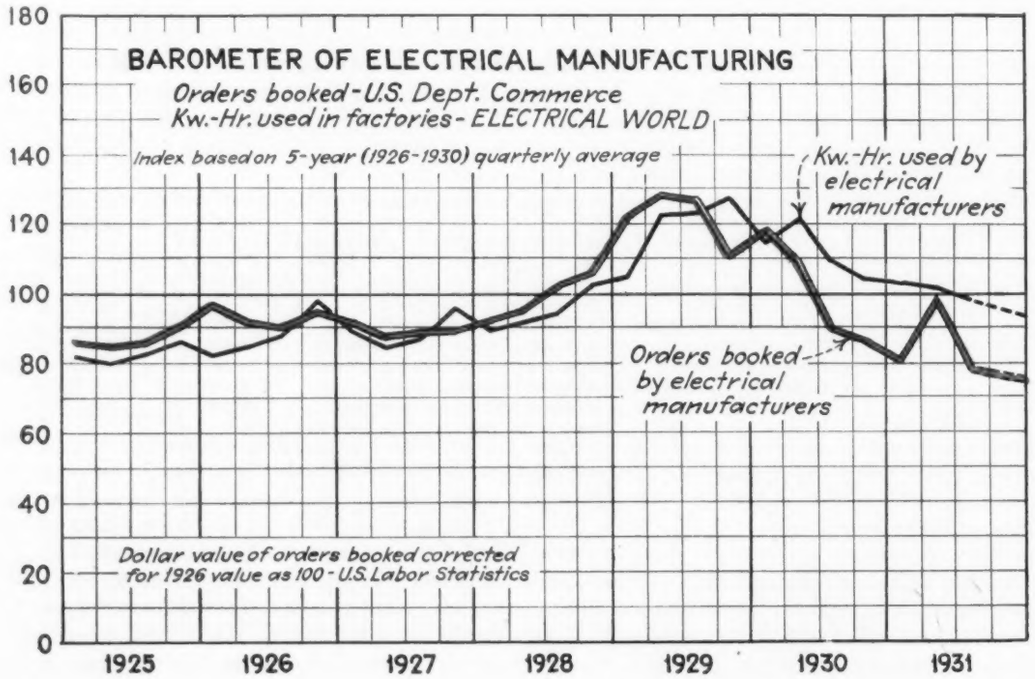
(Value of Products in Dollars — U. S. Census)

	1914	1919	1921	1923	1925	1927	1929
Generators, motor-generators, etc.	17,865,542	86,266,114	65,172,221	106,376,674	110,185,015	104,246,026	68,131,815
Household appliances	.....	.....	37,670,836	63,914,840	75,102,165	77,519,218	76,890,453
Insulated wire and cable	69,505,573	128,682,339	98,332,970	184,472,095	210,617,310	210,047,947	296,858,831
Incandescent lamps	17,350,385	57,646,900	59,728,398	71,966,225	73,558,210	87,933,244	85,319,515
Motors and parts	44,176,255	116,893,638	74,446,738	09,188,685	113,109,577	111,819,855	185,233,201
Radio apparatus	792,465	8,074,636	10,647,617	54,000,470	178,834,697	198,436,434	342,056,730
Switchboards and gear	15,382,662	26,327,837	36,298,897	57,856,166	69,759,067	71,924,341	79,424,219
Telephone apparatus	22,815,640	46,214,342	101,882,354	93,398,031	81,510,499	115,451,822	.....
Transformers	14,513,831	27.060,624	42,103,028	59,114,722	62,153,155	66,266,216	78,114,532
Wiring devices	7,580,000	26,919,178	21,806,416	34,966,232	34,806,452	32,703,331	43,120,093

—many similar opportunities exist for sales of very large magnitude. In every market the electrical industry finds opportunity to make its own level of prosperity high if it will intelligently and vigorously apply itself to sales under modern conditions of marketing.

At this time several positive acts by manufacturers are placing them in a better position to operate effectively in 1932. They are reducing all inventories to present market values; in preparation for new sales they are fixing price levels in terms of low levels in labor and commodities so that new price levels reflect present conditions and yet give a profit. Capital assets should be deflated also at this time and a good auditing is good business. Income tax time is here, whereby it is advisable and profitable to make all possible loss deductions. These basic acts are preliminary to definite sales and marketing plans for the coming year. They point the road to more and better business and they are internal and within the control of each manufacturer. Outside aid or governmental aid to a business enterprise is a snare and delusion. Business is down to 1923 levels and 1929 levels and standards should be forgotten in an endeavor to get 1926–1927 levels for 1932.

The sale of generating equipment has decreased very largely both because energy use has been curtailed and because of the forced building of 1929. It is estimated



Earnings Drop in Manufacturing

	Gross Sales				Earnings per Share			
	1927	1928	1929	1930	1927	1928	1929	1930
Allis-Chalmers Manufacturing Company	$33,352,252	$36,294,562	$45,302,355	$41,475,949	$10.02	$11.28	*$3.78	$2.86
American Brown-Boveri Electric Corporation[3]	578,944	1,187,017	747,277	252,884	.....	.....	.....	.....
Century Electric Company[2]	1,107,159	910,209	921,058	544,420	13.73	10.87	11.08	.....
Crocker-Wheeler Electric Manfg. Company[2]	194,543	170,911	508,597	214,017	2.01	1.08	1.23	0.49
Cutler-Hammer, Inc	9,345,156	9,340,749	12,368,340	9,342,899	5.20	5.24	9.77	3.61
Electric Storage Battery Company	45,640,291	46,219,193	48,412,420	36,889,454	7.09	7.82	8.78	6.22
General Electric Company	312,603,772	337,189,422	415,338,094	376,167,428	6.41	7.15	8.97	1.90†
Kelvinator Corporation[1]	20,122,865	18,120,602	21,947,344	21,450,896	.....	.....	1.03	1.35
Maytag Company[1]	25,582,684	22,527,306	25,625,557	14,470,938	2.87	2.85	3.33	.43
Ohio Brass Company[2]	2,506,455	2,002,058	2,823,057	.....	6.90	5.42	7.78	4.88
Otis Elevator Company[2]	7,057,641	7,614,106	7,855,491	5,859,066	13.44	16.09	16.56	3.44†
Radio Corporation of America	56,651,658	86,900,153	.....	.....	6.15	15.98	1.58	.02
Sangamo Electric Company[1]	3,103,934	2,927,166	3,545,150	3,020,677	3.23	1.61	4.12	2.39
Wagner Electric Company[2]	1,561,169	3,067,988	3,781,976	2,376,520	2.99	3.00	4.61	1.85
Western Electric Company	253,724,013	287,931,396	410,949,817	361,478,438	4.63	4.93	5.14	2.60
Westinghouse Electric & Manfg. Company[2]	185,543,087	175,456,815	216,364,588	180,283,579	6.91	8.95	10.33	4.46
Weston Electrical Instrument Corporation[2]	573,750	802,816	1,216,433	733,887	1.77	2.51	4.49	3.14

[1]Net sales. [2] Net profits. [3] Gross income. * Based on four for one split. † Stock adjustment.

that generating excess capacity already installed is about 25 per cent. Only a sudden return of heavy industrial load may be expected to create a large demand for generating equipment this year. Despite the large building program in transmission in the past the sale of transmission equipment for new lines and extensions was quite large in 1931. This year, however, except for the completion of projects now started, promises very few new transmission lines, consequently sales in this field must consist largely of replacements, synchronous condensers and substation equipment on existing lines. Oil-filled cable has proved itself and this market promises to develop satisfactorily.

In distribution equipment the sales have held up very well. Rural and urban loads have grown, extensions have been made, many properties have revamped existing distribution and the underground work has continued. This market promises to remain at existing levels in 1932 and even increase, especially if large sales of ranges make it necessary to rebuild services.

In the wiring supply field the market has been low. New construction of homes and buildings has been at a low level and little change for the better is expected. The most promising market here exists in raising wiring standards of existing installations and a joint industry program is under way to attain this objective. An aggressive sale of appliances is a very useful lever in forcing this market development. Exports of electrical equipment have dropped sharply both because of tariff barriers and exchange fluctuations. It appears evident that still further decreases may be expected.

Thus, unless very marked selling efforts are made, this year promises to give relative market changes about as follows:

Generating equipment—lower	Industrial—level.
Transmission equipment—lower.	Appliances—higher.
Substation—level.	Wiring supplies—lower.
Distribution—level.	Exports—lower.

These changes are the inertia changes to be expected from national business changes. If, however, the electrical manufacturer realizes that his markets can be sold independently of these national conditions, there is every reason to believe that business this year can be made to increase. Business loss or gain lies in the hands of the industry to a very large extent.

Radio Still Has 60 per Cent of the Country to Sell

In 1930 radio sets were owned by 12,078,345 families, or 40.3 per cent of the country's total of 29,980,146 families, according to tabulations of the Bureau of Census, U. S. Department of Commerce.

New Jersey leads in density of set ownership with 63 per cent. New York state is second with 57.8 per cent, Massachusetts third with 57.6 per cent and Mississippi last with only 5.4 per cent of its families boasting radio dials to twist.

Tabulation of percentages of families owning sets by regions shows the Middle Atlantic states leading with 55.3 per cent, closely followed by 53.8 per cent for the New England states and 50.2 per cent for the five East North Central states—Ohio, Indiana, Illinois, Michigan and Wisconsin.

In the Midwest and Central Northwest area eight states with 43.1 per cent of their families on the air approach the country's average, North Dakota with 40.8 per cent practically equaling it.

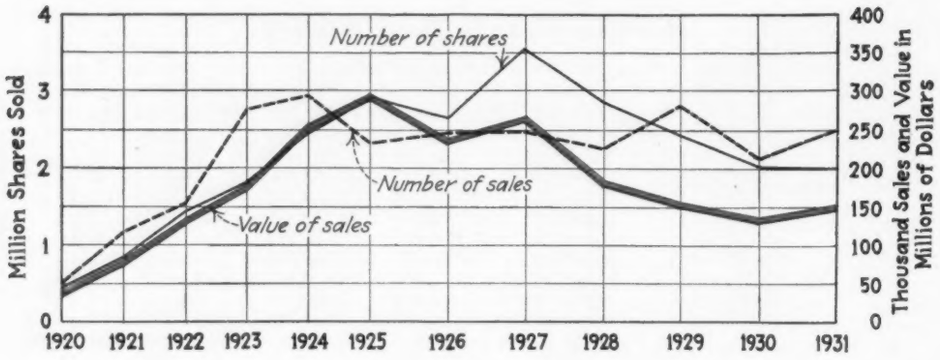
The three Pacific Coast states, California, Oregon and Washington, which form the only other group in which percentage of radio owners to total families exceeded the country's average, report 49.1 per cent.

The group of eight South Atlantic states from Delaware (45.8 per cent) down to Florida (15.5 per cent), including West Virginia (23.3 per cent) and the District of Columbia (53.9 per cent), averages only 19 per cent, with the two Carolinas and Georgia averaging less than 10 per cent of their families on the set-ownership roster.

Kentucky, Tennessee, Alabama and Mississippi show the lowest precentage (12.3 per cent) of any regional group, with the average of 16.5 per cent for the group made up of Arkansas, Louisiana, Oklahoma and Texas.

Utah with 41.1 per cent leads the eight Mountain states, which averaged 30.9 per cent, while New Mexico with 11.5 per cent is lowest in this group.

With this specific and detailed information in hand, radio manufacturers and distributors are in a preferred position to do intelligent sales planning.



Customers Invest $150,000,000

Now own one-fifth of entire assets of power and light industry. Reap $120,000,000 yearly in dividends.

CUSTOMERS of the power and light companies have expressed implicit confidence in the industry by again increasing their annual investment in its securities. Despite steadily declining markets and thoroughly unsatisfactory economic conditions, they advanced more than $150,000,000 in 1931—a transaction of very definite mutual value. It provides the customer with a form of stable investment with whose merits he is familiar. It enables the company to secure capital economically while at the same time virtually assuring customer loyalty.

This is by no means a record for sales to customers, but it is well over the 1930 total of $139,132,000. The peak year was 1925, when customers advanced almost $300,000,000. It is significant that at a time during the autumn, when public financing was virtually impossible, several companies were able to speed up their customer sales activities and secure capital that was not forthcoming from any other source. Among the most active companies in the distribution of stock to customers this year were Associated Gas & Electric, Southern California Edison, Pennsylvania Power & Light, Cities Service, and National Power & Light.

The value of shares sold in 1931 increased somewhat over the 1930 average. Last year there were 2,000,000 shares sold, against a slightly larger figure, 2,015,425, the year before. The trend toward larger individual sales has been evident since the peak year 1927, when 3,581,206 shares were distributed. This is presumably due to sales promotion work rather than to any definite change in size of the unit. Stock is, of course, sold at varying prices, ranging from $25 to $100. An average price of $75 per share is indicated for the year, although this figure has little significance.

The stake held by power and light customers in the industry is indicated by the fact that they have advanced well over two billion dollars in the past decade. This is approximately 20 per cent of the total value of the industry's plant and equipment. It is more or less permanent capital. While in most cases it is not voting stock, it represents an exceedingly important proprietorship interest in the industry, and is undoubtedly one of the most stabilizing influences. Since the distribution of common stock is limited, it is reasonable to suppose that the proportion of the industry's assets owned by customers will increase year by year. Assuming the total quoted is still largely in the hands of customers and that the average dividend rate is 6 per cent, power and light customers annually realize something like $120,000,000 in dividends from their investment.

Results of Customer Sales

Year	Number of Sales	Value	Number of Shares
1920	53,063	$43,000,000	454,139
1921	18,544	80,000,000	830,222
1922	156,725	130,000,000	1,450,707
1923	279,186	175,000,000	1,806,300
1924	294,467	254,000,000	2,478,165
1925	236,043	297,561,800	2,926,271
1926	248,867	236,557,100	2,686,187
1927	249,491	263,527,269	3,581,206
1928	227,961	181,682,041	2,880,833
1929	280,600	153,436,000	2,432,550
1930	225,800	139,132,000	2,015,425
1931*	250,000	150,000,000	2,000,000

*Partly estimated.

The Horizons of Recovery

By VIRGIL JORDAN
Economist McGraw-Hill Publishing Company, Inc.

TO ATTEMPT to point out to a despairing world in the depths of depression that it stands at the threshold—has perhaps already passed over the doorstep—of a profound change in certain aspects of its economic life which promises a period of unparalleled prosperity is to put oneself in the position of Columbus at the court of Isabella and to invite the same respectful attention he received for his proposed westward expedition to the Indies. Yet the economist who is worth his salt must assume the risks that the reckless Christopher ran and try to turn men's attentions from the doubts and despairs of the immediate present and the sterile statistics of a dead past toward a still unexplored but rapidly approaching horizon of real possibilities and hopes.

Accordingly I set down here barely and bluntly, without elaboration, some reflections that have been forced upon me by observing the fundamental and far-reaching influence which the increasing use of electric energy has already exerted, and attempting to foresee the further alterations it will make in our economic system in the course of the next quarter century. Electric energy has become the focus of future economic change; that is why these observations appear in this paper. Other technological developments will play a part in the picture, but of supplementary importance. An understanding of some of its implications should be helpful not only to public utility executives but to public authorities in dealing with problems of policy which its increasing development and application will precipitate:

1. Electric energy is the most economical or efficient means of converting solar energy into work so far devised. The technical development of its distribution over wide distances and its application to industrial and agricultural uses has barely begun. But it is already so enormously more productive per man-hour employed than human or animal energy based on food cultivation that its fullest possible application in the manufacture and distribution of goods and services—other things remaining the same—would have a most devastating effect upon the money value or price of consumer and capital goods based on their human labor or manpower content. Prices of manufactured goods made of mineral products, and most services involved in their production and distribution would practically disappear; the relative value of agricultural products would rise; wages of urban workers would fall; farmers' real income increase; the value of farm land would appreciate, and that of certain urban real estate sites, and many other kinds of fixed capital assets or older forms of tangible wealth would be destroyed.

This because the value of things heretofore has depended principally upon the human time and energy involved in producing them and moving them from place to place. Electricity, which by comparison with other forms of energy is almost free and unlimited in its availability, is annihilating space and time, the two sources of scarcity and consequently of value.

Money must increase with energy

But in economic affairs "other things" never remain the same. The catch in this picture of devastating deflation of values is the assumption that the money medium of exchange—the economic or financial counterpart of physical energy used in production—will not or cannot increase in correlation with the amount of energy used. But there is no reason to suppose that our banking system must permanently balk at playing its part. Here the credit mechanism enters its crucial test of co-operation with the electric motor in human service. The things I have suggested about the economic effects of the use of electricity were equally true of the application of steam power in the early stages of the industrial revolution. The world was saved from some of them partly by the Napoleonic wars—as it was by the World War—partly by the discovery of new supplies of gold in the early nineteenth century, as it was again by the establishment of the Federal Reserve System in 1914, which increased the efficiency of existing gold reserves. Yet in spite of the vast spasmodic credit expansions which occurred during the past century and a half, the long-term trend of price levels over the whole period has been downward.

Other influences came into play. The tremendous increase of population and the expansion of capital equipment, particularly for transportation, following the

industrial revolution, cushioned the economic impact of the application of steam power, absorbed the vast increase of agricultural production from new areas, prevented too drastic decline of prices and values. Today no such growth of population can be expected. The older types of capital equipment are already provided, and less needed. Agriculture has only begun to apply the principles of agro-biology discovered barely 50 years ago, and with the use of mobile power in the internal combustion engine and of electricity in speeding the growth cycle crop production on existing areas can easily be trebled or quadrupled with less human or animal labor than is now employed. Nothing can stop the relentless evaporation of money values except a corresponding expansion of credit or monetary media. Even with this offsetting influence, prices must decline more rapidly than wages, or working hours be shortened, so that the purchasing power of consumers per man-hour employed in production shall rise rapidly enough to absorb the product. Only in this way can profits and capital values be maintained, and even so savings must be continuously and quickly converted into consumption and many types of capital investment must be depreciated. But the net outcome must inevitably be an immeasurable increase and universal diffusion of prosperity.

Electricity insures stability

2. The increasing application of electrical energy not only guarantees the security of plenty, it assures stability based on self-sufficiency as nothing since the discovery of systematic agriculture in Egypt ten thousand years ago has done. The industrial revolution based on steam power was the basis of a profound political revolution. It broke the feudal power of ownership and control of land, up to that time the sole source of wealth. But it replaced this political power with another which proved similarly oppressive, the power of centralization implicit in the simple fact that the energy of steam had to be used at the source. From this fact sprang all the many-sided evils and the chronic instability of the industrial system during the first century of its development—the growth of large-scale enterprise, the overgrown factory, the overgrown city, imperialistic exploitation of backward countries, international competition for raw materials, resources and markets for finished manufactures which culminated in the World War.

The use of electrical energy is about to reverse in certain fundamental respects this whole century of evolution toward centralization and concentration. It is almost universally available, distributable almost without limit, or will soon be so. This means that national and local monopolies of energy, which is the basis of economic security, will tend to disappear. Moreover, this means universal mechanization of manufacture in every country which will wipe out or diminish the local or national differential advantages of special craft skill or low labor costs, upon which a large part of international and even domestic exchange of goods has been based. Finally, since electrical energy is the source of those advances in synthetic chemistry which have as yet barely begun, but have already destroyed many local or national raw material monopolies, a large part of international trade based upon them is bound to disappear. The outcome, already foreshadowed in the intensified self-sufficient nationalism in world economic affairs and in the increasing diffusion of domestic industrial operation, is certain to be a continuous decentralization of our economic structure, with greater local self-dependence, smaller-scale enterprise, less urban congestion, less long-distance transportation, relatively diminished international trade, narrower market areas, increased stability of the business structure. By a strange paradox the super-power system, with its centralized control and elastic pooling of energy resources, is the force that will reverse the tendencies toward economic centralization which have been the source of instability and insecurity.

Energy use produces leisure

3. Finally, the kilowatt will contribute not only to increased economic security and stability but, what is perhaps more important, to the liberation of the creative powers of the individual, which is the ultimate basis of social stability and political freedom. Fully to understand the significance of this aspect of the electrical age, it is necessary to bring the psychoanalyst's clinic, the statesman's study, the modern factory and the power station into a composite picture, and there is not space enough here for such a synthesis. Sufficient to say that the application of unlimited, infinitely divisible and completely controllable energy—such as electricity, along with the internal combustion engine, affords in all every-day aspects of individual life, in the home, at work, at play—is repeating in modern form the age-old legend of Prometheus. It is giving to every human the power and freedom of the gods, releasing him from darkness, fear and oppression, making him the master of his destiny. This is not merely a matter of the greater leisure for diversion or self-development which power puts at the disposal of every individual and his wife as compensation for irksome toil; far more important in its psychological significance is the fact that in the modern factory, with tools operated by individually controlled power, for the first time since the fateful day when Stephenson's steam engine began to pump the water out of the British coal mines, the worker is about to become the master of the machine that so long enslaved him. He can at last participate as a creative entity in the complex process by which he makes his living. This is the most important event in the economic, social and political evolution of the species, since the steam blew the lid off Mr. Watt's tea-kettle, and we have barely begun to see its consequences.

▼

Incandescent Lamp Sales in 1931

A preliminary estimate of the number of incandescent lamps sold in the United States during 1931 indicates a total of 557,400,000 for both large and miniature lamps, according to a review of the electrical industry by John Liston in the *General Electric Review* for January.

The quantity included 349,450,000 large lamps with metal filaments, a new high record, and 203,100,000 miniature lamps with metal filaments. There was a decided drop in the sale of carbon-filament lamps, which accounted for less than 1 per cent of the total. These lamps included only 4,850,000 large and miniature bulbs, less than one-third the production in the previous year.

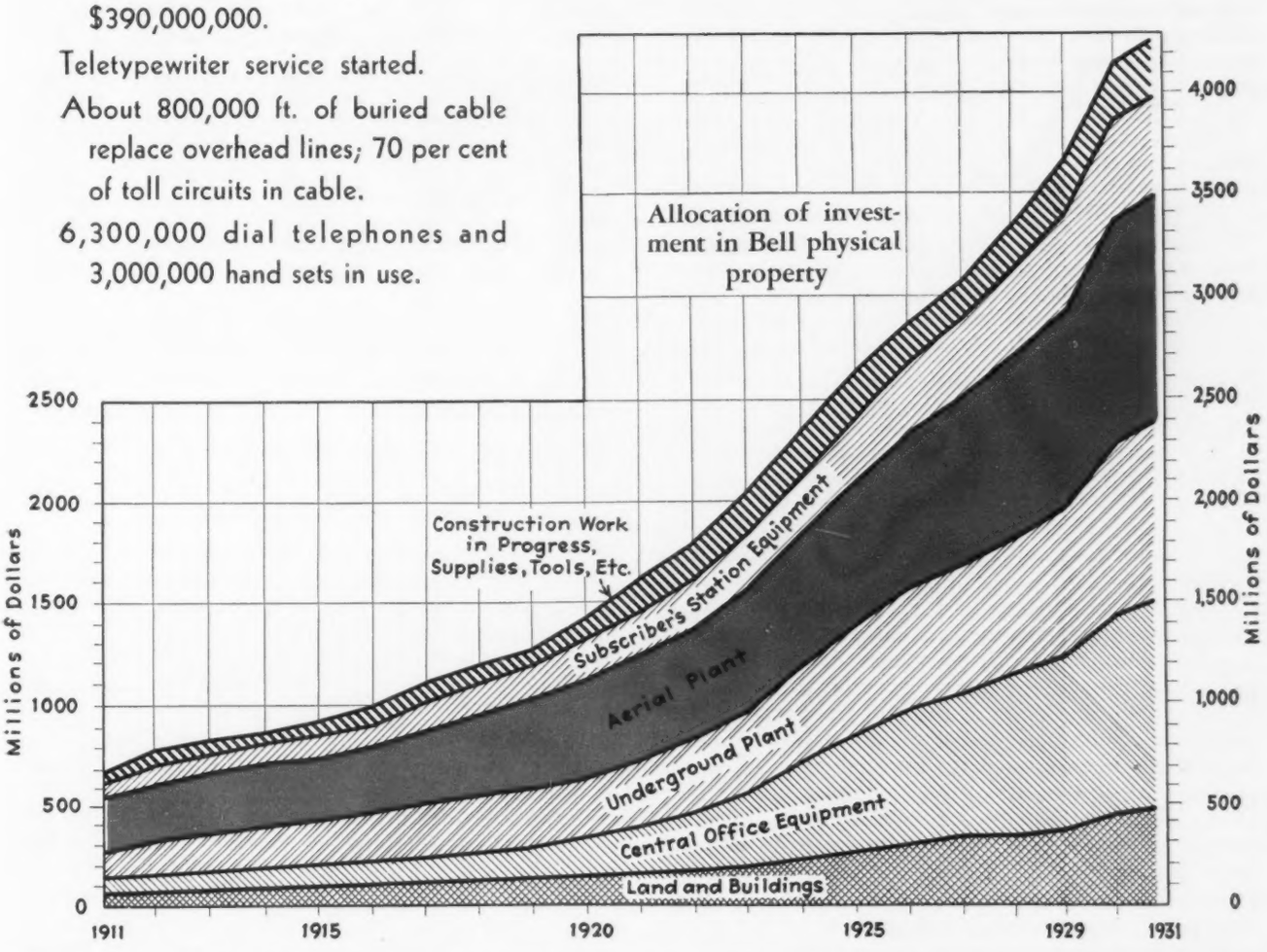
1931 Accomplishments in Telephone Field

Gross expenditures about $390,000,000.

Teletypewriter service started.

About 800,000 ft. of buried cable replace overhead lines; 70 per cent of toll circuits in cable.

6,300,000 dial telephones and 3,000,000 hand sets in use.



WHILE there has been a small decrease in the number of telephones in the United States during the year 1931, the telephone industry, in common with other electrical utilities, has not experienced the losses which have been common to general business throughout this year. The telephone plant has been extended and there has been a constant improvement in the quality of service given. The extension of the range of transoceanic services has continued and new projects looking to the further development of this type of service have been initiated. Switched teletypewriter service employing switching methods similar to those common in telephony was first given in November, 1931.

During the year 1931 the gross expenditures of the Bell System for new plant, including replacements, are estimated to have been $390,000,000. While this figure is not as high as that of the past three years, it exceeds similar expenditures for either 1926 or 1927.

A great deal of attention has always been given in the telephone business to improving its distribution system. Unlike urban services such as electric light and power and gas, telephone service requires an individual pair of wires from the central office to the subscriber, except, of course, in the case of party lines, where one pair of wires serves a group, usually not exceeding four. The standard form which the distribution plant takes in large cities is that of lead-covered, paper-insulated cables in ducts under the streets, and similar cable underground or suspended on poles in the suburbs. In early cables of the largest diameter which could be pulled in a 3-in. duct no more than 50 pairs of wires could be included. Due to constant development work, not only on cables but on instruments, switchboards and other parts of the plant, cables of 26-gage wire containing as many as 1,800 pairs are now practicable.

Pulp Insulation Supplants Paper Tape.—Recent devel-

Some Achievements on Bell Telephone System

Data Are for Year Ended December 31 in Each Case

	1910	1915	1920	1925	1930	Increase* during 1930
Number of Telephones:						
Bell Companies:						
Manual service	3,933,056	5,968,110	8,176,884	10,538,935	10,705,118	*694,734*
Dial service	0	0	157,095	1,496,289	4,976,941	962,788
Total	3,933,056	5,968,110	8,333,979	12,035,224	15,682,059	268,054§
Bell connecting companies and linesϕ	1,950,000	3,204,000	4,268,000	4,685,000	4,416,000	*267,000*
Total	5,883,056	9,172,110	12,601,979	16,720,224	20,098,059	1,054
Number of connecting companies	7,396	8,735	9,231	9,227	7,163	*622*
Number of connecting rural lines	10,449	19,579	26,032	28,861	29,281	*815*
Number of central offices	4,933	5,300	5,702	6,017	6,585	189
Miles of pole lines	282,877	330,602	358,091	386,064	422,489	7,062
Miles of Exchange Wire:						
Wire in underground cable	5,631,000	9,947,000	14,384,000	28,426,000	44,456,000	3,121,000
Wire in aerial cable	2,800,000	4,503,000	5,586,000	9,462,000	16,209,000	1,201,000
Open wire	1,247,000	1,602,000	1,634,000	1,953,000	2,202,000	34,000
Total exchange wire	9,678,000	16,052,000	21,604,000	39,841,000	62,867,000	4,356,000
Miles of Toll Wire:						
Wire in underground cable	386,000	626,000	1,364,000	2,057,000	5,769,000	1,538,000
Wire in aerial cable	70,000	99,000	299,000	1,210,000	4,576,000	671,000
Open wire	1,508,000	1,729,000	2,110,000	2,366,000	3,036,000	164,000
Total toll wire	1,964,000	2,454,000	3,773,000	5,633,000	13,381,000	2,373,000
Total miles of wire	11,642,000	18,506,000	25,377,000	45,474,000	76,248,000	6,729,000
Average Daily Telephone Conversations:†						
Exchange conversations	21,681,000	25,184,000	31,836,000	46,702,000	62,365,000	1,331,000¶
Toll conversations	603,000	819,000	1,327,000	2,098,000	2,933,000	*206,000*¶
Total conversations	22,284,000	26,003,000	33,163,000	48,800,000	65,298,000	1,125,000
Number of A. T. & T. Co. stockholders	40,381	65,512	139,448	362,179	567,694	97,893

* Decreases shown in italics. § Includes 145,508 telephones comprising net increase resulting from mergers, purchases, sales, etc.
ϕ Partly estimated. †For year ended December 31.
¶ A change in classification as between "exchange" and "toll" increased average daily exchange conversations by about 244,000 and reduced toll conversations correspondingly.

opments in these lead-covered cables have included the standardization of cables of less than 1,800 pairs employing 26-gage wires, reduction in the amount of paper insulation required for aerial cables and consequent decrease in diameter, with economies due to the lesser amount of material necessary, and the employment of so-called pulp insulation in place of the paper strip insulation which has long been standard. The strip insulation, which when applied to the smallest gage of wire consisted of a paper tape 0.0025 in. thick and 0.3 in. in width, required the use of comparatively expensive manila or manila mixture stock in order to stand up under the manufacturing process. The pulp insulating process, on the other hand, involves making the paper directly on the wire and permits the use of wood pulp, with consequent economies due to the lower cost of this as compared with manila stock. The insulation itself consists of a uniform sleeve of porous paper surrounding the wire, but not adhering too tightly to it.

Due to the peculiarly complex transmission requirements of telephone cables which result from the range of frequencies transmitted, there have been important electrical as well as mechanical problems to overcome in taking this step. It can now be said that these have been satisfactorily solved, and pulp insulation is employed in the manufacture of all 24- and 26-gage cables in the Bell System. In addition to the electrical and mechanical problems in developing pulp insulation, it was necessary to solve a number of problems relating to the splicing of such cables.

Underground Service Greatly Increased. — Another improvement relating to distribution which has now been made available in the Bell System is the use of tape-armored buried cable in the local underground exchange plant. There has been a considerable demand for this type of distribution, particularly in suburban neighborhoods, where, for the sake of appearance, it is desired to eliminate the street pole lines. During the year 1930 more than 200,000 ft. of buried cable was installed and it is estimated that three or four times that amount was installed in 1931. The new system employs an armored cable, usually buried in the interior of the block, or, in certain cases, along the street, with either underground or pedestal type terminals.

With the growth of the telephone plant the use of telephone poles has continued to increase, although perhaps at a slower rate than formerly, due to the increased amount of underground cable both in the local and toll plants. In a normal year 800,000 to 1,000,000 poles are installed in the Bell System for new work and replacement. Development work applying to these poles and to the other timber products has been carried on continuously.

New Pole Specifications. — One recent innovation which will be of decided advantage in connection with pole line engineering is the revision of the dimension tables for poles of the different species so that their various qualities could be equated in terms of a common classification, making it possible for engineering and cost comparisons to be made between species, class for class. Previous specifications for the different species had been based upon dimension tables developed independently, with no relation to each other or to those of other pole-using interests. The work upon these revised dimension tables required extensive studies of pole strengths, rates of decay and taper of the different species. In order to obtain the added benefits of national standardization, especially as affecting the supply situation, this work

was carried on in co-operation with the sectional committee of the American Standards Association working on specifications for wood poles, and the resulting tables were so prepared as to be adaptable under the various engineering practices of all pole-using interests.

Central Office Improvements.—One important phase of telephone central office development has been the provision of means for converting commercial power into such form as to be suitable for use in the telephone plant. The voltages most commonly employed in central office practice are 24 and 48 volts d.c. Not only must these voltages be maintained at very constant values but the source of current supply must be practically free from commutator ripples and other disturbances which might be of such frequencies as to create noise in the telephone circuits connected thereto. Storage batteries have been, and still are, essential in giving the requisite reserve capacity as well as insuring a noiseless source of power. Up to recently, special generators with so-called smooth-wound armatures have been employed for charging these storage batteries. Recently, however, due to the development of satisfactory filters employing electrolytic condensers and choke coils of large capacities, it has been possible to employ commercial generators with consequent economies due to the elimination of the special type previously needed. Another important evolution in connection with power plants has been the development of automatic power plants for converting commercial alternating current into that suitable for the telephone plant. These are employed largely in the smaller offices and have effected considerable economies of operation.

Dial telephones increase

Dial Telephones Total About 6,300,000.—The use of dial continues to increase. It is estimated that at the end of 1931 the number of dial telephones in the United States was 6,300,000, an increase during the year of about 700,000. The dial system employed by the Bell System in the larger cities is of the panel dial type.

Since the introduction of this type of equipment in 1921, many new equipment arrangements have been developed such as improved methods of handling calls between manual and dial subscribers. Reliability and speed of service have been increased and economies effected in equipment and operation. One of the improvements recently made available is the "decoder." The panel equipment requires an arrangement for "translating" the office code dialed into the correct routing for a call through the selector train. The office code is the first part of the subscriber's telephone number, which indicates the central office in which he is located. The decoder is a simplified translator, consisting principally of relays, instead of the power-driven machinery which made up the original translator arrangement. The decoder provides facilities for handling calls to an increased number of central offices, is more economical in operation and provides the greater flexibility necessary for the multiplicity of services required in a metropolitan area.

Subscribers' Equipment Improved.—During the past year the hand set, which is preferred by many telephone users, has increased in popularity in the Bell System. The number of hand sets in use at the end of 1931 totaled nearly 3,000,000, which is about 20 per cent of the total number of telephones in use in the Bell System.

A change which has improved the appearance of subscribers' apparatus and reduced the cost of its maintenance has been made in the unit containing the ringer, induction coil, condenser and other parts of the station set, for use with the hand set or the desk set. Due to the development of a smaller condenser and the complete redesign of the unit, it has been possible recently to reduce its volume to about 40 per cent of that of the previous unit. In addition, through the employment of molded plastic material to replace the steel box cover, the expense of refinishing these units has been considerably reduced and the new set has a better appearance.

Illustrative of developments intended to improve private branch exchange equipment is a new type of cordless private branch exchange board. This involves an improved equipment arrangement and a removable case which greatly facilitates the inspection and repair of these units.

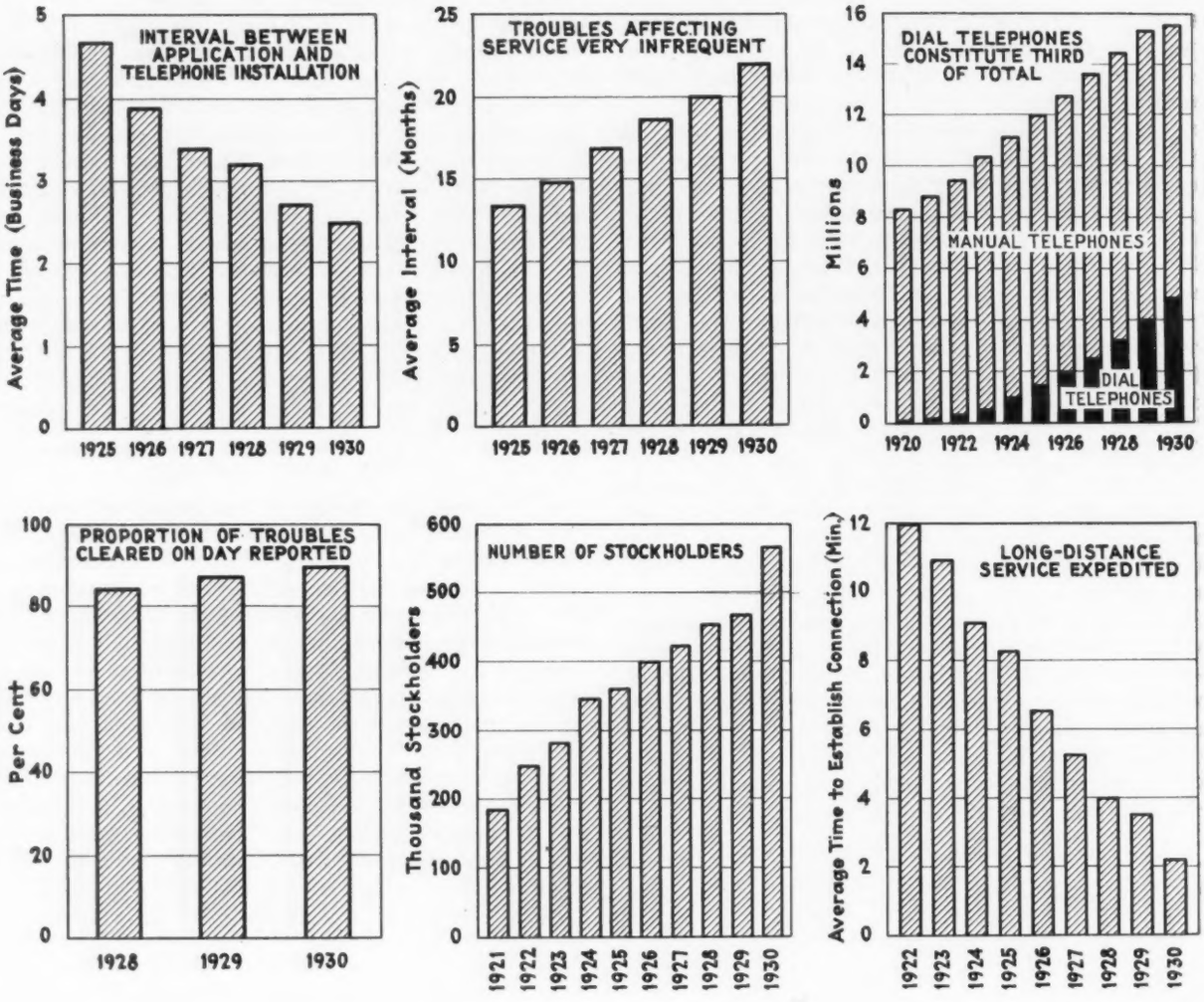
New factors in design

In the past the design of the local telephone plant, including both subscribers' lines and trunks, has been determined by the volume efficiency of the circuits employed. This method has given good results, but it has been appreciated for some time that, in addition to the volume obtained over a telephone connection, there were other factors affecting the satisfactoriness of the connection which the subscriber gets, the losses, for example, due to distortion of the complex voice waves in trunks connecting central offices, the noisiness of the room or other place in which the telephone instrument is located, and the amount of so-called "sidetone" which exists in the subscriber's instrument. Sidetone is the noise or speech reproduced in the subscriber's receiver as the result of the operation of his own transmitter.

In order to have a more complete basis than volume efficiency for determining the effectiveness of telephone transmission, extensive series of tests have been carried on by the American Telephone & Telegraph Company and by the American Telephone & Telegraph Company and the Bell Telephone Laboratories for a number of years to determine the effect of sidetone, distortion and room noise, as well as other factors, on the satisfactoriness of telephone conversations. In one series of tests observations were made on tie lines regularly used in connecting members of the staffs of the two companies involved, and a record was kept of the number of times either speaker requested that conversation which was not understood should be repeated. These tests were carried out on circuits in which the amount of noise, distortion and other factors were controlled. As a result, a new method of designing the local plant has been put into effect, which takes into account all of these factors and which will result in a better design of the local telephone plant from the transmission standpoint.

The use of loading coils continues to increase. At the end of 1930 there were in the local exchange plant of the Bell System approximately 2,000,000 loading coils employed in interoffice trunks. One factor in the increased use of loading coils has been the employment of permalloy dust, which has resulted in a coil approximately one-third of the size of that previously used. In addition, improvements, such as the use of welded steel cases in place of the older cast-iron type, have been introduced. Further improvements due to the use of better core materials are in prospect.

Time of Day by Telephone.—The Bell Telephone



Steady progress in the business

2½ days to connect phones after application.
Average telephone free of trouble 22 months.
4,977,000 dial telephones—one-third of total.
90 per cent of telephone troubles cleared in day reported.
Nearly 600,000 stockholders.
About two minutes to establish long-distance connection.

Companies have for some time been giving the time of day by telephone in certain cities. Recently new equipment has been developed for giving this service. A subscriber wishing the correct time calls the number assigned to the time bureau. Shortly after he will hear the time bureau operator make some such announcement as: "When you hear the signal the time will be eleven forty-five and one quarter." A moment later a short high-frequency tone will be heard when it is just that time. The operator's announcement is made only when one or more subscribers are connected to the time bureau, which is indicated to her by the lighting of a lamp. Two small electric clocks indicating the time in quarter-minute intervals are mounted before the operator. These are independent of each other and each is controlled by a separate master clock mounted on the wall of the room in front of the operator. The tone which indicates the exact quarter minute is produced automatically and is not under control of the operator.

A New Teletypewriter Service.—Announcement has been made recently by the Bell System of the introduction of switched teletypewriter service. Teletypewriters have been in use for some years in connection with private wire service contracted for by business concerns, press associations, police departments, air transport lines and others. The use of switching exchanges now provides a new type of service. In the Bell System this new service gives to the teletypewriter subscriber the possibility of securing connections, either local or long distance, identical with those now obtained with the telephone except that communication will be of the record type by means of the teletypewriter instruments. A message typed in one city will be immediately reproduced on the instrument of the subscriber in a distant city. The Bell Telephone Laboratories have developed a switchboard for use in connection with this service. It permits of the rapid interconnection of teletypewriter subscribers. In appearance it is much like a telephone switchboard except that the operator, instead of being furnished with transmitter and receiver, is supplied with a teletypewriter instrument. The first teletypewriter directory for the Bell System, issued December 7, 1931, contained the listings of more than 800 commercial stations and in addition more than 100 telephone company stations.

A timed wire service has been introduced by the Western Union and Postal Telegraph Companies.

New Insulating Material for Submarine Telephone Cables.—The new Key West-Havana cable, which was laid the latter part of 1930, has been cut into service during the year. This cable, which is of the single-core type, is operated on a carrier basis and furnishes three telephone circuits and four or more telegraph circuits. The number of facilities furnished by this single cable is as great as that furnished by the three loaded telephone cables laid in 1921. The older cables are of the continuously loaded type. The new cable, however, is unloaded, a feature of interest being the use of the insulating material "paragutta," a recent development of the Bell Telephone Laboratories.

Paragutta consists of a mixture of purified gutta-percha or balata materials, which for many years have been used for submarine cable insulations, together with a specially purified rubber and certain waxes, the resultant compound having mechanical properties as good as gutta percha and a dielectric energy loss which at high frequencies is but a fraction of that of gutta percha.

Cables Increase for Toll Service.—From 1925 to the end of 1930 the per cent of Bell System toll wires in cables had risen from 58 to 77 per cent. This transition from open wire, which means not only greater security against interruption by storms but better transmission, has continued. During 1931 the total mileage of toll cable, both quadded and non-quadded, increased from about 24,000 miles to 26,500 miles.

Inductive Co-ordination Continues.—Co-operation between power and communication companies in the co-ordination of their facilities has continued to advance during 1931. A feature of this work deserving special mention is the symposium on co-ordination of power and telephone plant conducted at the winter convention of the A.I.E.E. in January. A series of joint papers by engineers of the two industries was presented, reviewing the status and trends of important phases of this activity.

Under the direction of the joint general committee of the American Railway Association and Bell Telephone System recommended principles for handling problems of inductive co-ordination involving Bell System communication facilities and railway electrical supply facilities, particularly those of electrified railways, have been prepared and issued to the operating companies. Preparation of practices embodying the application of these principles has been well advanced.

Overseas Connections Extended.—The overseas connections made possible by the transatlantic radio links have been increased during the past year as follows:

Island of Java, in the Dutch East Indies, and Latvia, effective April 1, 1931.

Italy and Sicily (instead of northern Italy, Rome and Vatican City), effective April 6, 1931.

Canary Islands, effective August 15, 1931.

Bucharest and a few other principal cities of Roumania, effective November 9, 1931.

Northern portion of the island of Sumatra in the Dutch East Indies, effective November 12, 1931.

Rio de Janeiro, in Brazil, effective December 18, 1931.

The island of Bermuda, effective December 21, 1931.

The Hawaiian Islands, effective December 23, 1931.

In addition to the ship-to-shore services which are maintained on the Atlantic Coast to seven of the larger vessels on the transatlantic route, installations of radio stations for communication with an interconnection of tugboats and similar small craft are under way at Boston, New York, Seattle, San Francisco and Los Angeles.

Phototelegraphy and Television.—It is interesting to note that in addition to the use of telephotography in Europe and in the United States, installations have recently been made in Japan.

While no commercial application of television has as yet materialized in the communication system, development work continues. A recent development of the Bell Telephone Laboratories has been the use of multiple channels for television, which makes it possible to transmit a much larger total amount of details over the circuit, and hence to give television images of greater size and clarity.

▼

California Oil Industry 26 per Cent Electrified

By C. C. STEWART

Power Sales Supervisor
Southern California Edison Company, Ltd., Los Angeles, Calif.

That electricity is now taking an active part in the operation of the oil industry is shown by a survey just completed by the commercial department of the Southern California Edison Company, Ltd. This survey shows that 26 per cent of the total oil industry load in the territory served by the company is now on its lines.

It is of particular interest to learn that out of a total of 726,220 hp. of aggregate load in the oil industry there was only 800 hp. of Diesel engines in use. The four Diesels shown in pipe line service in the summary tabulation have not been used for two years, as the oil is by-passed around this station.

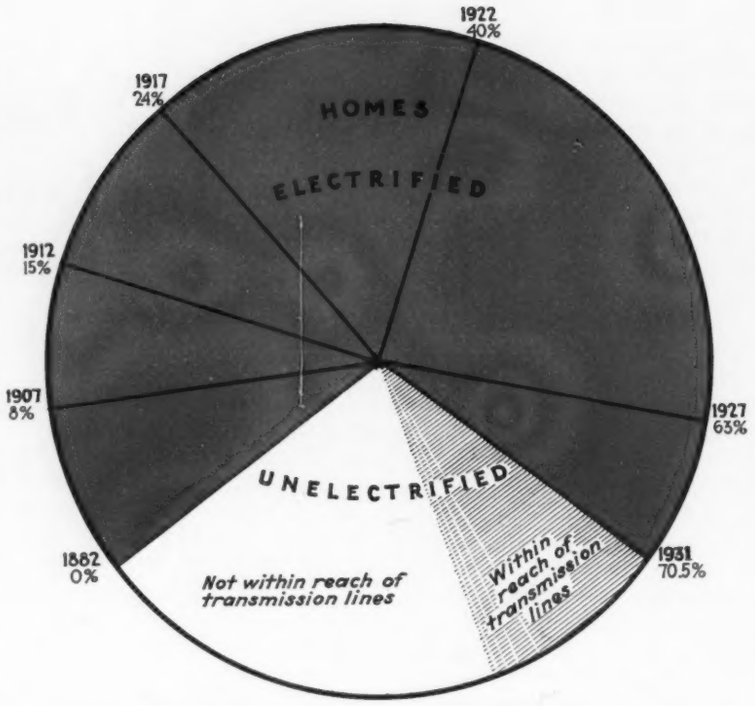
Distribution of Motive Power

in Oil Industries in Southern California Edison Territory

	Motors		Steam Engines		Gas Engines		Diesel Engines		Per Cent Electric
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.	
Pumping wells	1,419	51,170	769	26,195	2,342	84,601	..	...	31.6
Drilling wells	98	8,086	1,021	110,006	6	3,120	..	...	6.7
Gasoline plants	265	8,621	848	18,806	716	101,886	..	...	6.6
Refineries	1,389	42,234	245	29,003	35	3,705	1	100	56.3
Pipe line pumps	711	40,569	1,020	43,981	89	17,898	4	700	39.2
Miscellaneous	1,065	25,017	1,820	50,554	233	35,245	..	...	22.6
Gas lift	156	9,830	108	9,055	37	2,175	..	...	46.7
Electric 482 dehydrators	....	3,663	....	.....	....	.....	..	...	....
Totals	5,103	189,190	5,831	287,600	3,458	248,630	5	800	26.0

The survey shows that 56.3 per cent of the refinery load is motorized. Pipe lines are 39.2 per cent electrically pumped and 31.6 per cent of all well pumping is done electrically. The fact that only a small percentage of motors were used in gasoline plants was expected for the reason that gasoline plants operate almost entirely on free gas. Forty-six per cent of the compressors used in compressing gas for flowing wells in the territory are motor-driven. Electric motors for drilling oil wells have been replacing steam engines somewhat slowly. The oil companies in southern California had a large supply of steam-drilling equipment on hand and are replacing this with electric outfits as fast as new drilling equipment is purchased. One oil company now owns 22 complete electric drilling outfits and another has 20.

Customers Continue to Increase in Number



Most of the homes remaining unserved are in sparsely populated regions

IF THERE ever was a time in the history of the light and power industry when the number of customers might have been expected to decrease it was in 1931. Certainly people were economizing in their expenditures; in the industrial centers hardest hit by the decline in manufacturing not a few families reduced living costs by sharing apartments, this practice resulting in many vacancies. Many communities are fairly well saturated as to number of homes to be electrified. It was scarcely a propitious time for the opening of new stores and offices, nor would industrial motorization seem to have offered a promising field.

But so thoroughly has electric service entered into the woof of American life that despite local losses—and there were many—the year brought a net increase of 120,000 customers, or 0.5 per cent. As is usually the case, most of these, about 110,000, were residential; commercial light and power users did decrease numerically by nearly 16,000, but that decrease was more than offset by the 26,000 new wholesale customers.

These statistics somewhat understate the growth; no account is taken of the numerous reallocations of customers that are constantly being made throughout the country. If at some time in the past John Smith added a range to his previous service and if it was the practice of his local company to put such service on a separate meter he may or may not have been counted twice, depending on the method of accounting. If, subsequently, the company adopted the practice of putting all service on one meter, and providing for a low energy cost for cooking by a suitable revision of its rate structure, he assuredly was counted but once. Statistically, one Mr. Smith might vanish in the process. Lack of uniformity in defining the distinction between wholesale and retail commercial customers, coupled with changes in the definition, probably causes variation in the figures for these two classes that do not necessarily represent actual gains or losses. The upshot is that the proportion of homes electrically served remains at 70 per cent; the gain did not quite keep up with the estimated population growth, but in view of the reported drift from the cities back to the old farm home wherever that was a practical solution of the unemployment problem, it seems likely that the growth did keep pace with urban population. A year ago it was estimated that 86 per cent of urban homes had electric service. No reason appears to call for a revision of that estimate.

When the changes are examined by geographical regions and by states the influence of current economic conditions emerges more clearly. The table on the opposite page brings this out. The Pacific group leads in rate of growth, 1.7 per cent, followed by the Middle Atlantic with 1.3 per cent and New England with 1.0 per cent.

Increase in agricultural states

In the wheat belt gains have in the past generally been moderate compared with the country as a whole. The prolonged drought and depressed prices of grain would have accounted for a setback in 1931 in the West North Central States; but there was no recession, merely a smaller increase than usual, 15,211, or 0.6 per cent, against 39,000 in 1930. Further, the gain was greatest in the predominantly agricultural states; Nebraska, 1.3 per cent; Kansas, 1.2, and Minnesota 1.0 per cent. To the east of the Mississippi, Wisconsin and Indiana similarly stand out.

For the first time, so far as available records show, there are widespread areas reporting a decrease.

Central Station Customers

	Total Number				Domestic Lighting				Commercial Lighting and Small Power				Wholesale Power and Miscellaneous			
	1929	1930	1931	Increase in 1931	1929	1930	1931	Increase in 1931	1929	1930	1931	Increase in 1931	1929	1930	1931	Increase in 1931
UNITED STATES	24,147,183	24,555,732	24,675,835	120,103	19,967,154	20,331,551	20,441,249	109,698	3,598,115	3,628,653	3,612,872	—15,781	581,914	595,528	621,714	26,186
New England	2,183,205	2,234,947	2,257,602	22,655	1,809,850	1,858,598	1,880,515	21,917	335,037	339,222	336,574	— 2,648	38,318	37,127	40,513	3,386
Middle Atlantic	6,730,993	6,895,089	6,986,194	91,105	5,677,480	5,816,143	5,901,720	85,577	955,297	969,430	968,934	—496	98,216	109,516	115,540	6,024
East North Central	5,825,550	5,831,861	5,809,179	—22,682	4,960,210	4,970,999	4,953,953	—17,046	794,014	792,058	786,291	— 5,767	71,326	68,804	68,935	131
West North Central	2,336,958	2,376,182	2,391,393	15,211	1,921,563	1,958,726	1,967,527	8,801	354,387	359,934	369,672	9,738	61,008	57,522	54,194	—3,328
South Atlantic	1,782,337	1,818,943	1,809,365	—9,578	1,466,003	1,492,877	1,483,794	—9,083	291,767	302,312	302,367	55	24,567	23,754	23,204	—550
East South Central	830,461	845,899	834,456	—11,443	659,615	677,141	665,748	—11,393	155,679	153,677	158,492	4,815	15,167	15,081	10,216	—4,865
West South Central	1,319,707	1,330,057	1,323,916	—6,141	1,022,452	1,038,978	1,033,181	—5,797	239,033	234,461	233,947	—514	58,222	56,618	56,788	170
Mountain	652,537	653,496	650,855	—2,641	499,533	498,028	493,946	—4,082	99,981	96,405	94,732	—1,673	53,023	59,063	62,177	3,114
Pacific	2,485,435	2,569,258	2,612,875	43,617	1,950,448	2,020,061	2,060,865	40,804	372,920	381,154	361,863	—19,291	162,067	168,043	190,147	22,104
NEW ENGLAND																
Maine	192,480	199,536	204,781	5,245	146,775	152,946	157,242	4,296	38,928	40,124	40,729	605	6,777	6,466	6,810	344
New Hampshire	117,557	121,931	126,261	4,330	100,986	104,272	108,020	3,748	13,212	14,182	14,109	—73	3,359	3,477	4,132	655
Vermont	78,177	79,931	81,917	1,986	60,752	62,855	64,466	1,611	14,707	14,353	14,795	442	2,718	2,723	2,656	—67
Massachusetts	1,190,853	1,221,235	1,227,088	6,853	1,007,384	1,035,762	1,043,675	7,913	167,937	170,171	165,248	—4,923	15,532	15,302	18,165	2,863
Rhode Island	186,054	189,093	190,903	810	159,372	162,441	163,047	606	22,582	23,182	24,267	1,085	4,100	3,470	3,589	119
Connecticut	418,084	423,221	426,652	3,431	334,581	340,322	344,065	3,743	77,671	77,210	77,426	216	5,832	5,689	5,161	—528
MIDDLE ATLANTIC																
New York	3,586,967	3,648,040	3,677,415	29,375	3,043,398	3,099,932	3,128,801	28,869	519,557	523,497	522,994	—503	24,012	24,611	25,620	1,009
New Jersey	1,119,869	1,152,207	1,187,673	35,466	923,794	950,150	984,787	34,637	153,982	159,162	160,141	979	42,093	42,895	42,745	—150
Pennsylvania	2,024,157	2,094,842	2,121,106	26,264	1,710,288	1,766,061	1,788,132	22,071	281,758	286,771	285,799	—972	32,111	42,010	47,175	5,165
EAST NORTH CENTRAL																
Ohio	1,530,807	1,530,458	1,525,839	—4,619	1,318,520	1,319,348	1,314,897	—4,451	188,226	188,246	188,656	410	24,061	22,864	22,286	—578
Indiana	686,926	691,656	699,083	7,427	585,696	590,867	598,660	7,793	92,406	91,683	90,151	—1,532	8,824	9,106	10,272	1,166
Illinois	1,880,687	1,873,095	1,845,147	—27,948	1,589,429	1,589,547	1,568,095	—21,452	270,033	264,706	259,615	—5,091	21,225	18,842	17,437	—1,405
Michigan	1,105,874	1,099,311	1,095,871	—3,440	943,465	937,036	933,732	—3,304	158,621	158,344	157,636	—708	3,788	3,931	4,503	572
Wisconsin	621,256	637,341	643,239	5,898	523,100	534,201	538,569	4,368	84,728	89,079	90,233	1,154	13,428	14,061	14,437	376
WEST NORTH CENTRAL																
Minnesota	474,254	480,972	485,930	4,958	393,887	400,275	403,502	3,227	64,236	63,284	63,793	509	16,131	17,413	18,635	1,222
Iowa	461,027	468,818	469,721	903	374,659	382,186	380,700	—1,486	77,283	77,660	80,282	2,622	9,085	8,972	8,739	—233
Missouri	665,332	667,707	669,115	1,408	555,107	558,556	559,989	1,433	94,421	93,917	98,577	4,660	15,804	15,234	10,549	—4,685
North Dakota	66,396	67,094	67,302	208	50,567	51,220	51,352	132	13,420	13,469	13,417	—52	2,409	2,405	2,533	128
South Dakota	84,182	87,803	87,864	61	64,753	67,586	67,628	42	16,414	17,048	17,117	69	3,015	3,169	3,119	—50
Nebraska	241,693	247,778	251,079	3,301	202,027	208,292	210,404	2,112	34,764	36,115	36,970	855	4,902	3,371	3,705	334
Kansas	344,074	356,010	360,382	4,372	280,563	290,611	293,952	3,341	53,849	58,441	59,516	1,075	9,662	6,958	6,914	—44
SOUTH ATLANTIC																
Delaware	43,370	44,378	45,177	799	34,864	35,662	37,290	1,628	8,023	8,156	7,376	—780	483	560	511	—49
Maryland	443,128	447,806	323,712	9,490	376,548	380,687	273,618	10,110	64,709	65,138	48,405	—516	1,871	1,981	1,689	—104
District of Columbia			133,734				117,179				16,217				188	
Virginia	240,506	263,551	271,575	8,024	208,648	222,329	229,541	7,212	27,215	36,562	37,471	909	4,643	4,660	4,563	—97
West Virginia	193,693	200,462	206,416	5,954	145,893	151,187	156,588	5,401	44,489	45,897	46,454	557	3,311	3,378	3,374	—4
North Carolina	246,706	251,335	252,945	1,610	196,549	200,149	202,212	2,063	45,048	46,660	46,576	—84	5,109	4,526	4,157	—369
South Carolina	119,208	124,232	124,896	664	95,801	100,097	100,933	836	22,114	22,562	22,559	—3	1,293	1,573	1,404	—169
Georgia*	237,270	242,852	*208,345	—34,507	193,803	197,917	*163,903	—34,014	42,293	43,710	*43,217	—493	1,174	1,225	1,225	0
Florida	258,456	244,327	242,715	—1,612	213,897	204,849	202,530	—2,319	37,876	33,627	34,092	465	6,683	5,851	6,093	242
EAST SOUTH CENTRAL																
Kentucky	285,467	292,135	284,717	—7,418	229,253	234,702	226,898	—7,804	51,212	51,766	52,691	925	5,002	5,667	5,128	—539
Tennessee	250,401	253,504	250,240	—3,264	198,691	202,758	201,311	—1,447	45,273	44,833	46,851	2,018	6,437	5,913	2,078	—3,835
Alabama	191,559	193,443	194,657	1,214	151,677	155,526	154,254	—1,272	38,711	36,310	39,146	2,836	1,171	1,607	1,257	—350
Mississippi	103,034	106,817	104,842	—1,975	79,994	84,155	83,285	—870	20,483	20,768	19,804	—964	2,557	1,894	1,753	—141
WEST SOUTH CENTRAL																
Arkansas	133,693	132,412	129,930	—2,482	96,110	95,737	94,332	—1,405	30,684	30,859	29,911	—948	6,899	5,816	5,687	—129
Louisiana	187,862	193,178	195,730	2,552	150,039	156,574	158,437	1,863	30,418	29,267	29,013	—254	7,405	7,337	8,280	943
Oklahoma	298,144	301,995	297,184	—4,811	225,959	227,660	223,584	—4,076	52,633	53,315	52,837	—478	19,552	21,020	20,763	—257
Texas	700,008	702,472	701,072	—1,400	550,344	559,007	556,828	—2,179	125,298	121,020	122,186	1,166	24,366	22,445	22,058	—387
MOUNTAIN																
Montana	87,186	85,120	85,828	708	64,158	66,844	67,253	409	19,766	15,137	15,242	105	3,262	3,139	3,333	194
Idaho	85,005	83,016	78,680	—4,336	54,063	52,853	49,778	—3,075	15,886	14,307	12,850	—1,457	15,056	15,856	16,052	196
Wyoming	34,970	36,241	35,021	—1,220	28,970	30,067	29,152	—915	4,813	4,827	4,610	—217	1,187	1,347	1,259	—88
Colorado	208,752	211,133	211,780	647	163,344	164,834	164,704	—130	29,735	31,116	30,197	—919	15,673	15,183	16,879	1,696
New Mexico	32,673	33,781	34,579	798	26,197	27,055	27,408	353	4,814	4,995	5,443	448	1,662	1,731	1,728	—3
Arizona	68,124	73,038	71,406	—1,632	55,505	56,347	54,674	—1,673	10,182	10,344	10,103	—241	2,437	6,347	6,629	282
Utah†	118,171	†111,870	112,783	913	94,296	†85,672	86,070	398	12,312	13,172	13,622	450	11,563	13,026	13,091	65
Nevada	17,656	19,297	20,778	1,481	13,000	14,356	14,907	551	2,473	2,507	2,665	158	2,183	2,434	3,206	772
PACIFIC																
Washington	443,402	454,143	463,296	9,153	335,947	343,326	347,736	4,410	60,685	60,311	62,268	1,957	46,770	50,506	53,292	2,786
Oregon	234,679	241,795	245,336	3,541	183,488	187,564	189,209	1,645	36,373	36,852	37,195	343	14,818	17,379	18,932	1,553
California	1,807,354	1,873,320	1,904,243	30,923	1,431,013	1,489,171	1,523,920	34,749	275,862	283,991	262,400	—21,591	100,479	100,158	117,923	17,765

*Change from preceding year due in part to revisions reducing total customers by 45,000 (see text)

†Change from preceding year due in part to revisions reducing total customers by 12,000.

Central-Station Customers, All Classes

As of December 31; from U. S. Census of Electric Light and Power Companies for years prior to 1928, except 1926; N.E.L.A. from 1928; 1931 estimated on the basis of ten months' operations. N.E.L.A. figures for 1926 and 1927 differ slightly from these.

Region	1912	1917	1922	1926	1927	1928	1929	1930	1931	Number of Families 1930
New England	313,227	647,289	1,143,697	1,823,146	2,007,649	2,115,380	2,183,205	2,234,947	2,257,602	1,987,405
Middle Atlantic	822,906	1,523,862	3,242,775	5,480,753	6,033,547	6,466,856	6,730,993	6,895,089	6,986,194	6,388,913
East North Central	940,883	1,884,042	3,311,010	5,074,961	5,313,705	5,587,893	5,825,550	5,831,861	5,809,179	6,376,518
West North Central	451,386	9,888,104	1,560,698	2,104,125	2,188,623	2,268,430	2,336,958	2,376,182	2,391,393	3,325,674
South Atlantic	193,909	357,577	679,081	1,425,343	1,564,711	1,689,151	1,782,337	1,818,943	*1,809,365	3,519,476
East South Central	107,106	184,126	351,899	615,300	721,576	781,694	830,461	845,899	834,456	2,276,750
West South Central	223,283	373,180	605,331	1,067,560	1,133,458	1,245,517	1,319,707	1,330,057	1,323,916	2,874,460
Mountain	182,108	337,087	445,270	572,497	597,576	627,391	652,537	653,496	*650,855	918,708
Pacific	491,730	791,276	1,357,372	2,129,100	2,229,503	2,370,940	2,485,435	2,569,258	2,612,875	2,312,242
United States	3,837,518	7,178,703	12,709,868	20,292,785	21,790,238	23,153,252	24,147,183	24,555,732	*24,675,835	29,980,146

*For comparison, the 1930 figure for the South Atlantic States should be decreased by 45,000, that for the Mountain States by 12,000, and the total for the United States by 57,000 to adjust for reclassification of customers as reported by certain companies.

Broadly, these are in the regions noted for three conspicuously important industry groups that have suffered severely during the past two years: Automobiles and its tributary industries, oil production and mining. Even in these areas the decrease by states has been moderate, though individual companies have sustained larger relative losses.

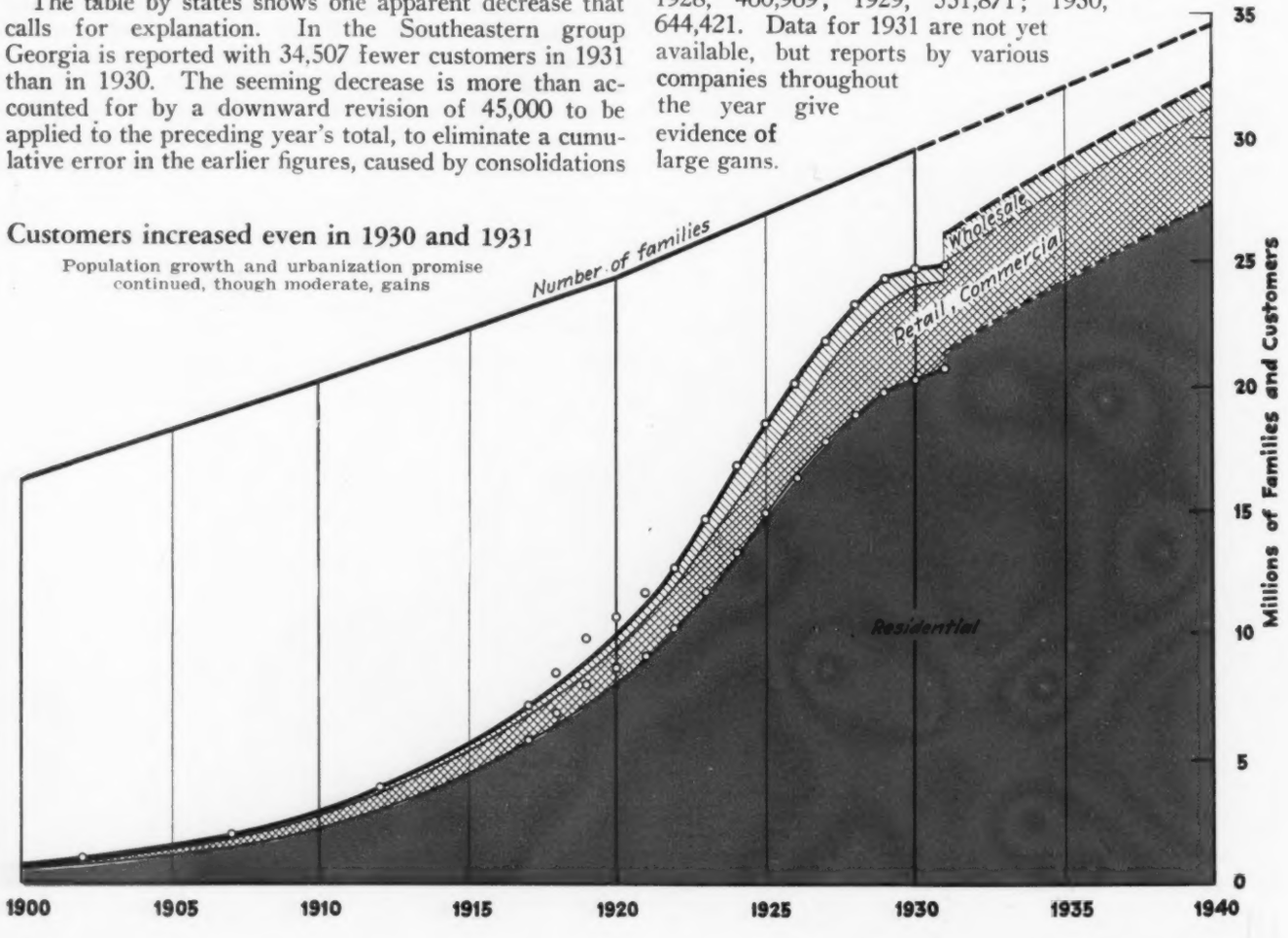
In the East North Central States the 0.4 per cent decline was concentrated in Illinois, Ohio and Michigan; in the Southwest three states out of four were affected, Louisiana being the exception; in the Mountain region three mining states lost somewhat more than the other five gained; in the South Central, the shrinkage of 2.6 per cent in Kentucky is noteworthy.

The table by states shows one apparent decrease that calls for explanation. In the Southeastern group Georgia is reported with 34,507 fewer customers in 1931 than in 1930. The seeming decrease is more than accounted for by a downward revision of 45,000 to be applied to the preceding year's total, to eliminate a cumulative error in the earlier figures, caused by consolidations and incomplete data. Comparisons should be made in the light of this revision.

The fact of a continued country-wide increase both in 1930 and 1931, under unfavorable conditions, indicates that the possibilities of adding new customers are by no means exhausted. With the greater attention now being given to farm electrification, still 90 per cent incomplete as to numbers, another 5,000,000 to 6,000,000 families become potential customers and will gradually become actual customers as extension of lines to small hamlets and towns brings more farms within reasonable distance of existing service. Recent growth in this field is shown by the National Electric Light Association's figures on the estimated number of farms served: At the end of 1928, 460,969; 1929, 551,871; 1930, 644,421. Data for 1931 are not yet available, but reports by various companies throughout the year give evidence of large gains.

Customers increased even in 1930 and 1931

Population growth and urbanization promise continued, though moderate, gains



Ownership Changes Rare

MAJOR shifts in utility control and ownership during 1931 were rare. For one thing the consolidation of the industry into large units is largely completed. Also economic and market conditions have not been especially conducive to transfers and exchanges of stock. And prospective buyers hesitate to make commitments in a period of rapidly shrinking values.

It is not improbable, however, that the near future may see a resumption of acquisitions by the major groups. Prevailing low security prices offer attractive opportunities to those larger groups which are in a position to acquire additional properties and which believe that a reasonable degree of stabilization has been achieved. Many of the larger systems, moreover, are in a relatively strong cash position. At the end of September, for example, Commonwealth & Southern Corporation reported about $26,000,000 in cash and $19,000,000 in U. S. government securities. Electric Bond & Share Company reported almost $45,000,000 in cash, call and time loans and more than $8,000,000 in short-term government and municipal issues. Other larger systems are similarly situated. With generating capacity well in advance of immediate requirements in most cases, possession of cash reserves of this magnitude suggests at least the ability to acquire other properties. Furthermore, some of the large systems are reported to have called in advances from subsidiaries. In any event, rumors of prospective acquisitions have not been lacking.

Prominent among the few changes of control that did occur in 1931 was the consolidation of the Tenney properties with the New England Power Association. Intra-system changes of importance include the acquisition of control of Electric Power & Light by Electric Bond & Share Company and a regrouping of most of the Associated Gas properties under Mohawk Valley Company.

Merger movement among major systems largely completed.

Market and economic conditions not conducive to exchanges or purchases.

Other ownership changes of some magnitude were the sale of the electric properties of Galveston Electric Company and Galveston Houston Electric Railway Company, of the Stone & Webster group, to the Houston Lighting & Power Company, in the Electric Bond & Share group, and the interchange of properties between National Electric Power Company and the United Gas Improvement Company, the former acquiring the Columbus, Delaware & Marion Electric Company, and the latter the Chester Valley Electric Company and the Kennett Gas Company.

By sales at auction the National Electric Power Company acquired properties of Atlantic Public Utilities and New England Power Association bought Green Mountain Power Corporation.

A number of places have decided to experiment again with municipal ownership by the building of local plants. In Jamestown, N. Y., where service came partly from private sources, partly from a municipal plant, the latter has been extended and now serves also Celerion and Falconer, adjacent towns. Other towns are Richmond, Ky.; Lenox, Remsen and Lake Mills, Iowa; Kenyon and Blooming Prairie, Minn.; Sullivan, Mo.; Eaton and Piqua, Ohio; Brooklyn, Wis.; Starkville, Miss.; Oakdale, La., and Puyallup, Wash.

Utility Mergers and Acquisitions in 1931

(Including changes received too late for inclusion in list published January, 1931)

Acquiring Company	*Company Involved*
AMERICAN ELECTRIC POWER CORPORATION	
Iowa Public Service Co.	(M) Manning Electric Light & Power Co. Municipal Utilities Corp. Plants in Clarion and Emmetsburg, Iowa.
AMERICAN ELECTRIC SECURITIES CORPORATION	Scioto Valley Railway & Power Co. (Ohio)
AMERICAN GAS & ELECTRIC COMPANY	Summitville Electric Light & Power Co. (Ind.)
Atlantic City Electric Co.	Municipal plant of the Borough of Beach Haven, N. J.
AMERICAN POWER & LIGHT COMPANY	(Under supervision of Electric Bond & Share Co.)
	(A) Southwestern Power & Light Co.
	(C) New Mexico Electric Service Co.
Central Arizona Light & Power Co.	Glendale, Ariz., municipal electric system.
Washington Water Power Co.	(A) Stevens County Power & Light Co.
	(A) Stevens County Public Service Co.
AMERICAN STATES PUBLIC SERVICE COMPANY	St. Ignace, Mich., municipal electric light plant. (now St. Ignace Public Service Co.)
APPALACHIAN GAS CORPORATION	Empire Corp.
ASSOCIATED GAS & ELECTRIC SYSTEM	
Gas Utilities, Inc.	Hilliard Light & Power Co. (Ohio)
	Wyandot Light & Power Co. (Ohio)
Paint Township Light & Power Co.	(M) Dundee Light & Power Co. (Ohio)
CENTRAL PUBLIC SERVICE COMPANY	
Central Cities Public Service Co. (New)	Central Illinois Electric & Gas Co.
Central Gas & Electric Co.	Baraga County Light & Power Co. (Mich.)
	Bridgewater Electric Co.
	Mt. Carmel Public Utility & Service Co. (Ill.)
	Pecatonica Electric Co. (Ill.)
	St. Hillaire Electric Co. (Ill.)
Central Illinois Electric & Gas Co. (New) (formerly Rockford Gas Light & Coke Co.)	(M) Emden Water, Light & Power Co. (Ill.)
	(M) Illinois Public Utility Co. (Ill.)
	(M) Rockford Electric Co. (Ill.)
	(M) Rural Gas Supply Co. (Ill.)
	(M) St. Joseph-Oakwood Electric Co. (Ill.)
	(M) United Fuel Transportation Co. (Ill.)
CENTRAL WEST PUBLIC SERVICE COMPANY	
South East Public Service Co.	Almond Light & Power Co. (N. C.)

Acquiring Company	*Company Involved*
CITIES SERVICE COMPANY	
	Ozark Utilities Co.
THE COMMONWEALTH & SOUTHERN CORPORATION	
Ohio Edison Co.	
	Physical property Ravenna division Ohio Electric Power Co.
ELECTRIC POWER & LIGHT CORPORATION	
(Under supervision of Electric Bond & Share Co.)	
Arkansas Power & Light Co.	
	(A) Wilson Power & Light Co.
ENGINEERS PUBLIC SERVICE COMPANY	
Puget Sound Power & Light Co.	
	Index, Washington municipal power plant
INTERNATIONAL UTILITIES CORPORATION	
International Public Utilities Co.	
	White Mountains Power Co. (N. H.)
MIDDLE WEST UTILITIES COMPANY	
(National Electric Power Company group listed separately below)	
Central Illinois Public Service Co.	
	(M) Lovington, Ill., electric municipal property (M) Shelbyville, Ill., municipal plant
Central Power & Light Co.	
	(M) Aransas Pass-Rockport Light, Ice & Power Co. (Texas) (M) George West Utilities Co. (Texas)
Kansas Electric Power Co.	
	(M) Thayer, Kan., municipal distribution system
Michigan Gas & Electric Co.	
	(M) Dowagiac Light & Power Co. (Mich.)
Southwestern Gas & Electric Co.	
	(M) Avinger Light & Power Co. (Texas)
West Texas Utilities Co.	
	(M) Dalhart Public Service Co. (Texas)
MIDLAND UNITED COMPANY	
	(M) American Public Utilities Co. Terre Haute Electric Co., Inc. (Ind.)
Indiana Electric Corp.	
	(M) Colfax Electric Co. (Ind.) (M) Indiana Gas Light Co. (Ind.) (M) Moran Electric Light & Power Co. (Ind.) (M) Mulberry Light & Power Co. (Ind.) (M) Noblesville Water & Light Co. (Ind.) (M) Stilesville Electric Co. (Ind.) (M) West Lebanon Electric Light, Heat & Power Co. (Ind.) (M) Zionsville Water & Electric Light Co. (Ind.)
Midland Utilities Co.	
	Gary Electric & Gas Co. (C) Gary, Heat, Light & Water Co. (Ind.)
Public Service Co. of Indiana (Formerly Interstate Public Service Co.)	
	(M) Cambridge Light & Power Co. (Ind.) (M) Harrodsburg Light & Power Co. (Ind.) (M) Interstate Power Company
Northern Indiana Public Service Co.	
	(M) Indiana By-Product Gas Co.
NATIONAL ELECTRIC POWER COMPANY	
(Controlled by Middle West Utilities Co.)	
	Northeastern Utilities Co. (Organized to take control of numerous small properties, including electric properties in Maine, Md., Mass., Ind., Ohio, Va. and W. Va., formerly of Atlantic Public Utilities, Inc.)
Central Eastern Power Co.	
	Buckeye Light & Power Co. Columbus, Delaware & Marion Electric Co. Physical Property Suburban Power Co. and General Light & Power Co.
Eastern Shore Public Service Co.	
	Maryland Light & Power Co. (subsequently merged)
Jersey Central Power & Light Co.	
	Eastern New Jersey Power Co. (subsequently merged)
Michigan Electric Power Co.	
	Physical property of Vassar, Mich.
Ohio Electric Power Co.	
	Physical property Urban, a division Ohio Ed. Co.
Public Service Company of New Hampshire	
	(M) Bethlehem Electric Co. (M) Lisbon Light & Power Co.
Tide Water Power Co.	
	Physical property Beaufort, N. C. Physical property of Gas Dept. Carolina Gas & Electric Co. Physical property Morehead City, N. C. (municipal)
NATIONAL POWER & LIGHT COMPANY	
(Under supervision of Electric Bond & Share Co.)	
Houston Lighting & Power Co.	
	Galveston Electric Co. (Texas; electric properties only) Galveston-Houston Electric Railway Co. (Texas; electric properties only)
Pennsylvania Power & Light Co.	
	Citizens Electric Co. (Pa.) Conestoga Valley Electric Co. (Pa.) Farmers Electric Co. (Pa.) Halfpenny & Grove, Inc. (Pa.) Hubley Electric Co. (Pa.) (A) Lancaster County Railway & Light Co. (Pa.) Edison Electric Co. of Lancaster, Pa. Intercourse Electric Co. (Pa.) Lancaster Electric Light, Heat & Power Co. (Pa.) Naomi Pines Electric Co. (Pa.) New Kingston Elec. Lt., Heat & Pwr. Co. (Pa.) Penns Creek Hydro Electric Co. (Pa.) Wrightsville Light & Power Co. (Pa.) Pioneer Electric Light Co. (Pa.) Sherman Valley, Elec. Lt., Heat & Pwr. Co. (Pa.)
Tennessee Public Service Co.	
	(A) Knoxville Power & Light Co. (Tenn.)
NIAGARA-HUDSON POWER CORPORATION	
New York Power & Light Corp.	
	Speculator, N. Y., power plant and distribution system
Niagara, Lockport & Ontario Power Co.	
	Ripley Electric Co. (N. Y.)
NEW ENGLAND POWER ASSOCIATION	
	North Boston Lighting Properties (C) Charles H. Tenney & Co.
Massachusetts Power & Light Associates (New)	
	Lawrence Gas & Electric Co. (Mass.) Lowell Electric Light Corp. (Mass.) North Boston Lighting Properties controlling Beverly Gas & Electric Co. (Mass.) Eastern Massachusetts Electric Co. (Mass.) Gloucester Electric Co. (Mass.) Haverhill Electric Co. (Mass.) Malden Electric Co. (Mass.) Salem Electric Lighting Co. (Mass.) Suburban Gas & Electric Co. (Mass.)
New England Power Association	
	Deerfield River Electric Co. Green Mountain Power Corp. (Vt.) South Vernon Light & Power Co., Inc. (Vt.) Vernon Electric Light Co. (Vt.) Whitingham Electric Light & Power Co.
NORTH AMERICAN LIGHT & POWER COMPANY	
Missouri Power & Light Co.	
	(M) Bevier, Mo., municipal light plant (M) Callao, Mo., municipal light plant
United Power & Light Corp. (of Kansas)	
	(M) Canton, Kan., municipal plant
NORTH CONTINENT UTILITIES CORPORATION	
Highland Utilities Co.	
	Eads Light & Power Co. (Colo.)
STANDARD POWER & LIGHT CORPORATION (Operations managed by Byllesby Engineering & Management Corp.)	
Standard Gas & Electric Co.	
	(A) California Power Corp.
Oklahoma Gas & Electric Co.	
	Davis, Okla., municipal distribution system Lamont, Okla., municipal distribution system Morrison, Okla., municipal distribution system Lincoln Utility Co. distribution systems in towns of Agra, Calumet, Carney, Kendrick, Sasakwa and Tryon, Okla. United Power & Light Co. distribution systems in towns of Deer Creek, Dougherty, Luther Nardin and Stratford, Okla.
TAMPA ELECTRIC COMPANY (Under executive management of Stone & Webster Service Corporation)	
	(M) Dade City Utilities Co. (Fla.) (M) Plant City Utilities Co. (Fla.) (M) Polk County Public Service Co. (Fla.)
SOUTHERN PUBLIC UTILITIES COMPANY	
	Double Springs Light Co. (N. C.) Leaksville Light & Power Co. (N. C.)
TRI UTILITIES CORPORATION	
West Virginia Water Service Co.	
	West Virginia Utilities Co.
UNITED GAS IMPROVEMENT COMPANY	
Chester County Light & Power Co.	
	(M) Kennett Gas Co.
Commonwealth Utilities Corp.	
	(C) Chester Valley Electric Co. and Kennett Gas Co. (Pa.)
Conowingo Power Co.	
	(M) Conowingo Electric Light & Power Co. (Pa.) (M) Northern Maryland Power Co. (Pa.)
Delaware Power & Light Co.	
	(M) Wilmington Gas Co.
Southern Pennsylvania Power Co.	
	(M) Delta Electric Power Co. (Pa.) (M) Delta Water Power Co. (Pa.) (M) Lower Chanceford Elec. Lt., Heat & Pwr. Co. (Pa.) (M) Peach Bottom Township Electric Co. (Pa.)
UNITED LIGHT & POWER COMPANY	
Kansas City Power & Light Co.	
	(M) Municipal Power Transmission Co. (Kan.)

Acquiring Company	*Company Involved*
WESTERN MASSACUSETTS COMPANIES	
Lee Electric Co.	(M) Southwick Electric Light Dept.

Canada

Acquiring Company	*Company Involved*
AMERICAN COMMONWEALTHS POWER CORPORATION	
Canadian Utilities, Ltd.	Prince Albert, Sask. Electric Light Plant
ASSOCIATED GAS & ELECTRIC SYSTEM	Montague Electric Co., Ltd. (P.E.I.)
MANITOBA POWER COMMISSION	Brandon, Manitoba property of Canada Gas & Electric Corp.
MIDDLE WEST UTILITIES COMPANY OF CANADA	
Great Lake Power Co. (New)	(M) Algoma District Power Co. (Sault Ste. Marie, Ont.)
	(M) Great Lake Power Co. (Sault Ste. Marie, Ont.)
MONTREAL LIGHT, HEAT & POWER CONSOLIDATED	Verdun, Que., distribution system
NOVA SCOTIA LIGHT & POWER COMPANY	
Avon River Power Co.	Middleton, N. S., municipal power plant
F. B. MCCURDY AND OTHERS	Cape Breton Electric Co., Sydney, N. S.

(A) Assets acquired or properties and assets.
(C) Control.
(M) Merged.

▼ ▼ ▼

1932 Budget $454,000,000

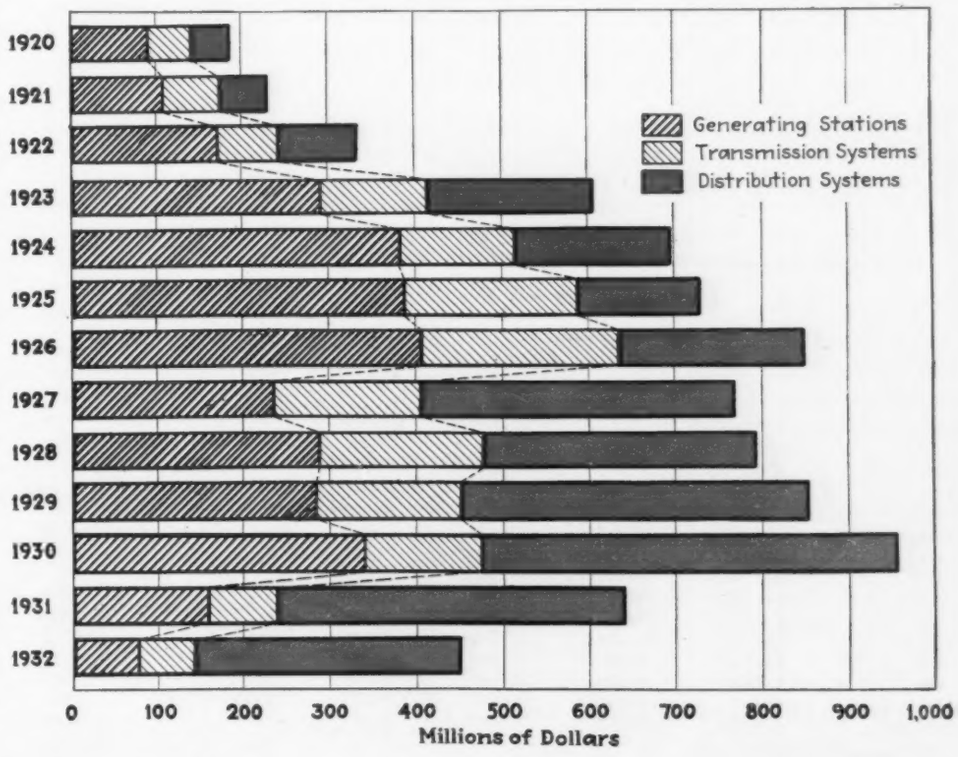
GENERAL comment is heard in utility circles that it is difficult to make budgets for 1932 under present conditions. Both security market and business conditions that make for load growth place handicaps on planning capital expenditures.

Budgets are made, however, and letters and telegrams to the ELECTRICAL WORLD produce a budget estimate of $454,570,978 for 1932 for all light and power companies in this country. This compares with 1931 capital expenditures of $633,415,020 and the high mark of $960,889,000 in 1930.

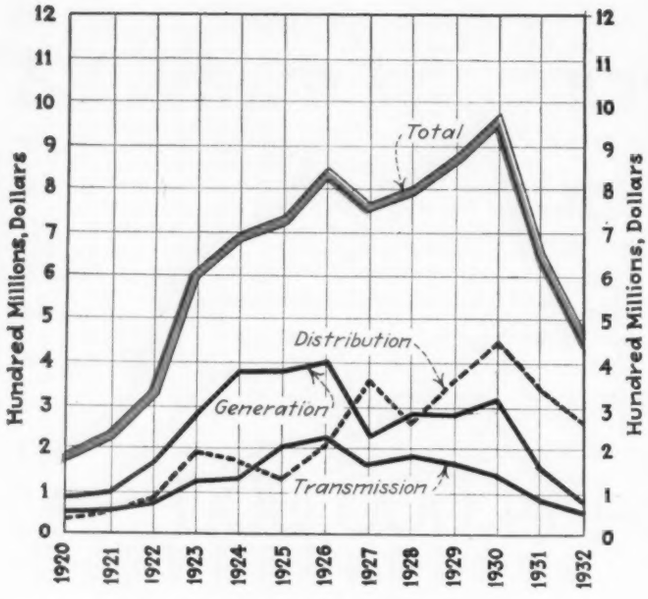
Expenditures in 1931, while below budget, were fairly normal and were made largely to carry to completion the extraordinary expansion program of 1930. Large additions to both steam and hydro generating capacity were completed, so that 1932 sees a large drop in new generation projects. The total expenditures for generation in 1931 was $162,842,777, divided into $96,147,407 for steam and $66,695,370 for hydro. The generation budget for 1932 is $80,403,805, divided into $59,308,623 for steam and $21,094,185 for hydro. No section plans very large hydro developments at this time, although Hoover Dam, not included in the budget, would bring an appreciable increase to the contemplated expenditures. Even the Pacific Coast plans to spend about as much for steam plants as it does for hydro plants in 1932.

In transmission construction the budget totals $55,458,844, as compared to 1931 expenditures of $80,913,755. This is concentrated in the far West, the North Central and Middle Atlantic regions. Apparently the major transmission structures have been built in rural regions and in newly developed regions such as the South.

Distribution and substation expenditures predominate in the 1932 budget, aggregating $292,649,455, as compared to $347,883,801 in 1931. Many systems have increased their budgets for distribution and this reflects the growth of domestic load, changes to network installa-



Decreased expenditures in 1932; distribution to take major part



Peak of expenditures in 1930

tions and greater use of underground circuits. There has been a slowing up in expenditures for office buildings and the 1932 budget reflects the stress now placed on economies in capital expenditures.

Budgets were reduced to a minimum by all large holding company groups. Most of these had expanded facilities rapidly in the past few years and, wtih load increases small in magnitude, found it unnecessary to spend, except for distribution and substations. Also, apparently, the state of the security market had an influence upon budget decisions. It is difficult to raise money for expenditures. On the other hand, many independent properties increased their budget over 1931 expenditures. These are largely old-established metropolitan properties that have had stable loads and even load increases during the year. Even with these properties, however, the major expenditures will be for distribution and substations.

Actual expenditures in 1932 depend upon many conditions. Primarily there must be a revival in business and an increase in confidence. If industrial load comes back to normal there will be a big demand for equipment because domestic and commercial business has been growing steadily during the depression. No one can yet predict business prospects for next year, but the budget announced at this time represents a minimum expenditure for business at present levels. Any change in business for the better and an improvement in security market conditions should have a favorable effect upon expenditures.

Table I—Generation and Transmission Expenditures

(Thousands of Dollars)

Year	Total Construction Budgets	Total Expenditures for Generating Plants	Total Expenditures for Transmission and Distribution	Miscellaneous† Expenditures
1921	$222,408	$102,674	$119,734	.....
1922	324 016	164,333	159,683	.....
1923	602,143	283,813	318,330	.....
1924	692,440	379,240	313,200	.....
1925	721,300	380,000	341,300	.....
1926	841,344	400,107	441,237	.....
1927	760,353	234,883	525,470	.....
1928	786,978	284,874	453,796	48,308
1929	866,344	281,460	528,896	55,988
1930	960,889	325,296	569,654	65,938
1931	633,415	162,843	428,797	41,775
1932	454,570	80,403	348,108	26,059

†Not separated in earlier years.

Table II—System Expenditures by Sections

	Eastern	Southern	North Central	Western
1921	$43,136,000	$29,341,000	$67,900,000	$82,031,000
1922	101,525,000	49,805,000	96,700,000	75,986,000
1923	211,196,000	82,105,000	206,180,000	102,662,000
1924	259,196,000	104,460,000	218,950,000	109,180,000
1925	190,300,000	130,500,000	260,200,000	140,300,000
1926	200,107,000	190,500,000	280,605,000	170,132,000
1927	247,961,000	191,190,000	213,994,000	107,208,000
1928	253,277,000	182,322,000	244,060,000	107,319,000
1929	265,847,000	176,585,000	293,564,000	130,348,000
1930	308,596,932	194,395,948	318,096,822	139,800,040
1931	201,696,625	114,034,925	208,641,731	109,041,739
1932	153,449,570	75,591,796	137,223,441	88,306,171

Table III—Steam Power Plant Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$80,107	$30,000	$120,000	$25,000	**$255,107**
1927	53,593	35,128	43,585	13,711	**146,017**
1928	49,841	45,537	58,749	16,906	**171,033**
1929	53,891	37,600	75,299	15,758	**182,548**
1930	56,226	35,866	94,013	21,794	**207,901**
1931	28,582	14,396	41,731	11,437	**96,147**
1932	20,442	7,056	22,358	9,453	**59,309**

Table IV—Hydro Plant Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$20,000	$60,000	$20,000	$45,000	**$145,000**
1927	39,436	21,913	6,020	21,497	**88,866**
1928	38,717	43,926	8,610	22,588	**113,841**
1929	28,784	21,575	25,071	23,482	**98,912**
1930	36,461	31,229	17,746	39,007	**117,395**
1931	27,949	6,547	10,932	21,266	**66,695**
1932	4,595	1,754	4,411	10,333	**21,094**

Table V—Transmission Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$50,000	$60,456	$60,605	$60,000	**$231,061**
1927	32,147	47,830	61,055	22,121	**163,153**
1928	71,097	28,999	67,519	18,575	**186,190**
1929	44,015	35,059	60,589	27,902	**167,565**
1930	42,601	33,910	48,910	15,662	**137,085**
1931	25,966	11,881	24,096	18,969	**80,913**
1932	16,471	7,201	15,455	16,330	**55,458**

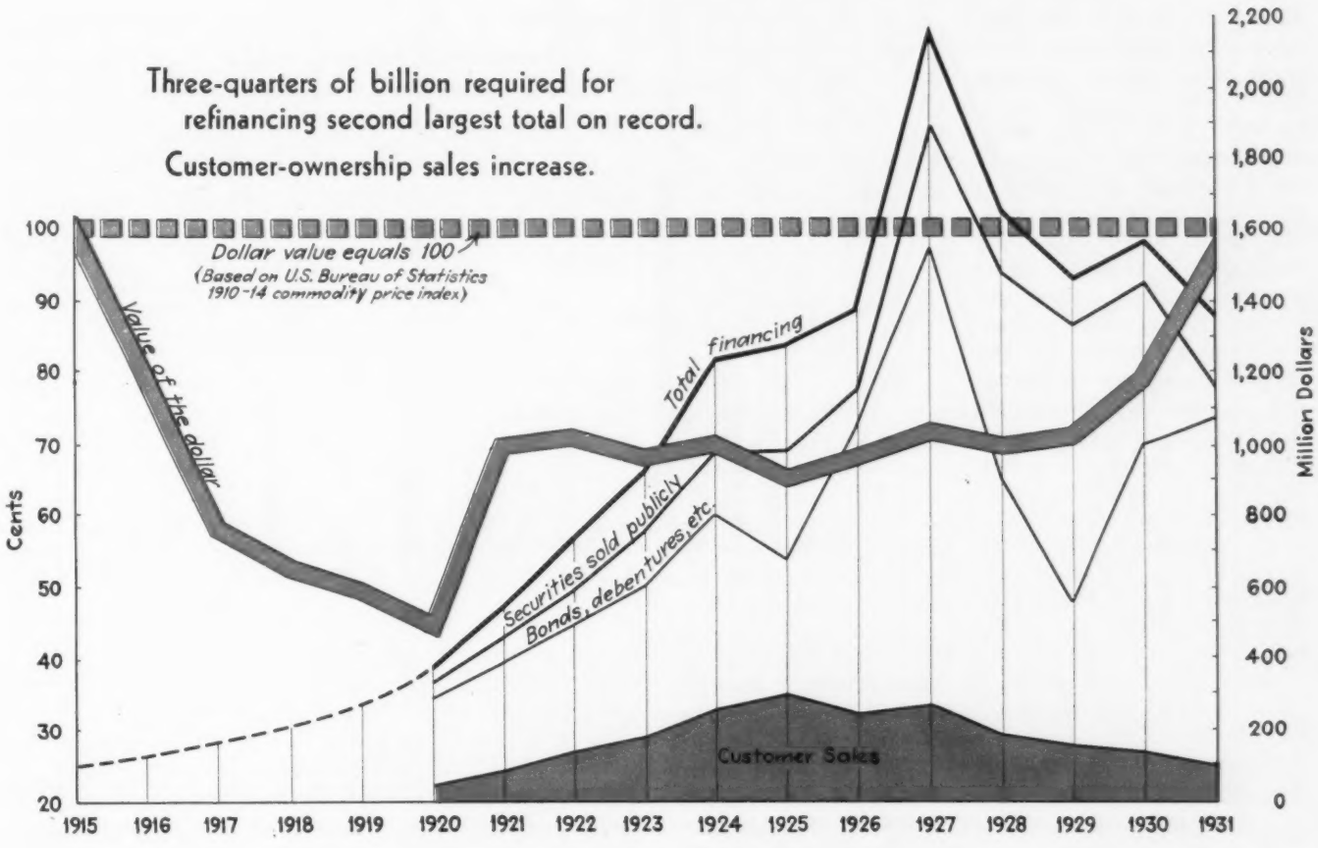
Table VI—Distribution Expenditures

(Thousands of Dollars)

Year	Eastern	Southern	North Central	Western	Totals for U. S.
1926	$50,000	$40,044	$80,000	$40,132	**$210,176**
1927	122,785	86,320	103,344	49,878	**362,317**
1928	80,927	51,753	88,960	45,966	**267,606**
1929	122,401	73,457	109,444	56,029	**361,331**
1930	152,762	103,079	128,784	58,540	**432,570**
1931	106,650	74,813	116,090	50,329	**347,883**
1932	101,824	55,864	87,841	47,118	**292,649**

Utility 1931 Financing

$1,491,742,000



THE year 1931 offered the utilities and their sponsors more opportunity for self-analysis and retrospect than any year since large-scale expansion was undertaken after the war. Adverse business has induced critical studies of policies and methods. Federal Trade Commission hearings have brought past procedure into the limelight. Sales resistance has led the investment banking fraternity to scrutinize balance sheets and corporate structures more critically than ever before. All this tends to have a salutary effect on costs, ratios and future financial policies.

This glance backward shows that since the war power and light companies raised an amount of capital almost equivalent to the present national debt of the United States. Three-quarters of it, roughly, went into new construction. This capital was secured under considerable difficulty, especially during the early part of the period. Competition for capital for intensive industrial development and rather unsatisfactory credit conditions in the industry itself a decade ago led to high money costs. It is also significant that during this entire period the purchasing power of the dollar was far below par, reaching a low of about 45 cents in 1920. Only recently it has returned to approximately its normal buying power with the steady decline in prices.

Economists say that recurrent periods of inflation and deflation are necessary safety valves to sustain the otherwise sound and stable capitalistic system. It seems that consuming capacity cannot quite keep up with productive capacity at times and that deflation or capital con-

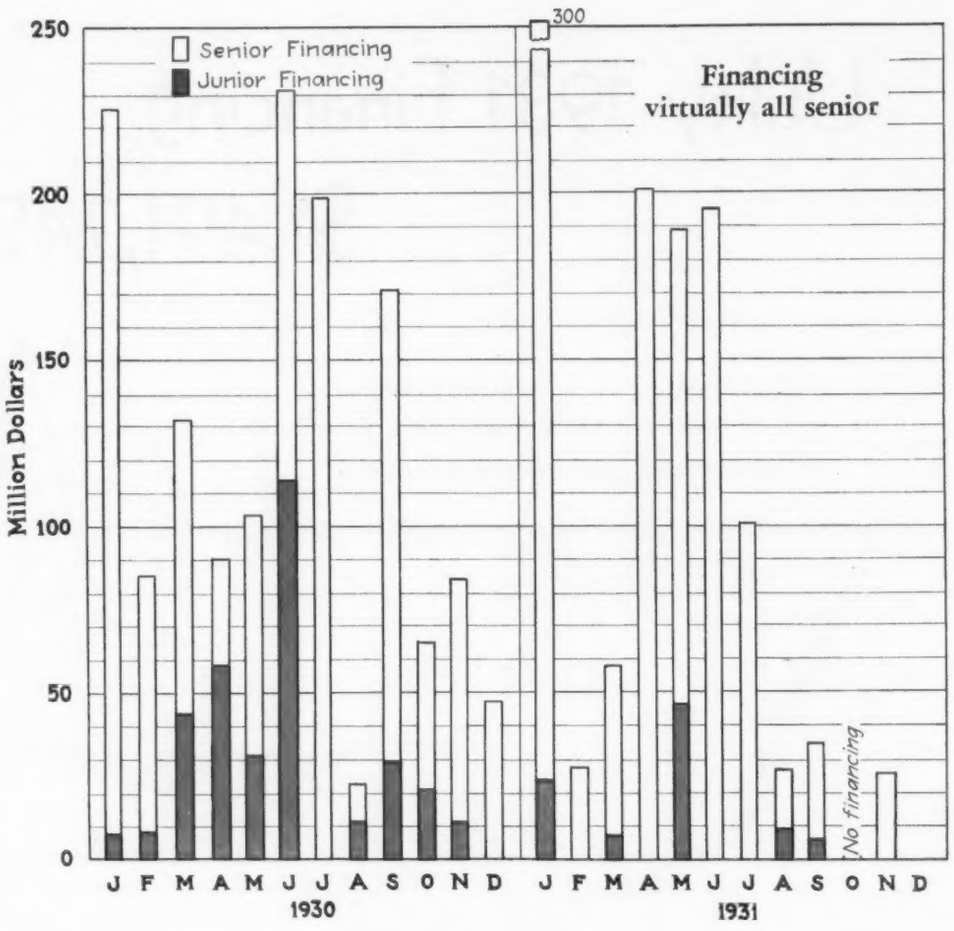
Financing Over Ten-Year Average

	Public Sales	Customer Sales	Total Sales
1920	$326,374,000	$43,000,000	$369,374,000
1921	458,917,000	80,000,000	538,917,000
1922	589,961,000	130,000,000	719,961,000
1923	747,722,000	175,000,000	922,722,000
1924	982,421,000	254,000,000	1,236,421,000
1925	982,223,000	297,561,000	1,279,784,000
1926	1,150,965,000	236,557,100	1,387,522,100
1927	1,888,909,000*	263,527,000	2,152,436,000
1928	1,471,497,000*	181,682,041	1,653,179,000
1929	1,328,708,000*	153,436,000	1,482,144,000
1920	1,452,853,000*	139,132,000	1,591,985,000
1931	1,341,742,000*	150,000,000†	1,491,742,000

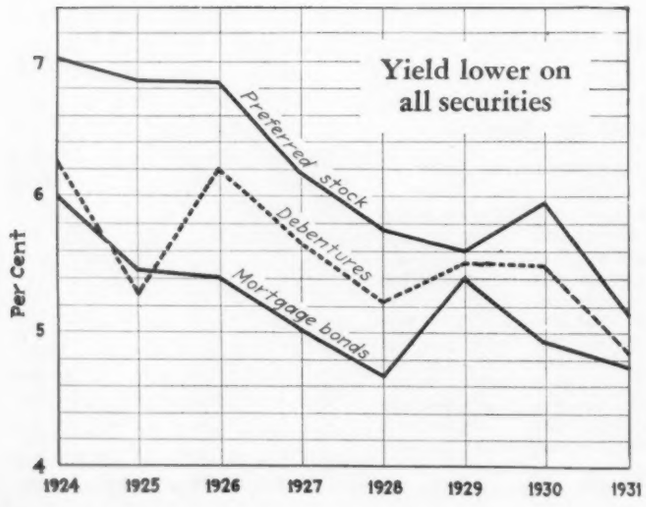
*Including rights. †Estimated.

fiscation is necessary in the readjustment.

Aside from theory, however, the electrical industry faces certain facts at the present time. All securities have been deflated in the markets for both manufacturers and utilities—a capital confiscation. But then the parallel stops. Revenues of manufacturers have dropped some 40 per cent from 1929 levels, while those of utilities have been changed very slightly. It is in book value or historical value of plant and equipment that another striking contrast occurs. Manufacturers, in common with all industrials, have written off their capital investments very rapidly during the past decade. This has been a management policy and a financial policy with this group. But the utilities have grown under a different environment, whereby the regulatory management and financial policies have made no provision for a rapid write-off of investments. Thus about 70 per cent of the total investment in utilities was made in the recent period when a dollar was worth 70 cents relatively and the balance sheets record this investment at its historical magnitude. Measured by present dollar values this investment has been confiscated 30 per cent without bookkeeping recognition and without previously anticipated provisions for writing it down to present levels.



What should be done is a debatable question. Some guess that an inflation period will occur again very quickly to readjust to higher levels. It is equally valid, however, to guess that present levels will continue for some years. It is true that earnings are stable on historical investment values and that courts and commissions will sustain earnings on these actual investments made in good faith. But, if present levels continue for some time, both in the public interest and the competitive interest of utilities, it would be wise to write down the existing investments and to provide for capital write-off in future investments. This, however, would necessitate an almost revolutionary change in regulatory policy, financing policy and management policy. It may be both necessary and advisable.



But a false and negative reaction to the situation is to stop all capital expenditure. This is the road to stagnation. With every market unsold it is wise to put in more capital provided the increment additions earn adequate return. In addition, ultra-conservatism would provide for write-off of the increment capital additions through its earnings. A bookkeeping situation should not interfere with industry expansion. The deflation of securities was the real element of capital confiscation.

There is a natural curiosity with regard to the alleged extension of so-called "banking control" in the realm of utilities, especially as depression persists in staying with us indefinitely. It is only natural that the bankers should have something more to say than ordinarily relative to nature and set-up of new issues at times like these, when investors are unusually cautious. This is probably the principal basis for rumors that this or that utility is now controlled by the Morgan or some other banking interests. In any event, large-scale mergers have been singularly lacking in 1931 and "banking control" has not extended itself through that channel. In actual control

Electric Light and Power Securities Sold in 1931

	Amount of Issue	
Mortgage Bonds (average yield 4.67 per cent)		
6 issues yielding from 4.21 to 4.28 per cent	$139,016,000	
8 issues yielding from 4.32 to 4.47 per cent	172,500,000	
8 issues yielding from 4.50 to 4.59 per cent	77,484,000	
9 issues yielding from 4.62 to 4.75 per cent	238,500,000	
11 issues yielding from 4.76 to 5.00 per cent	51,650,000	
10 issues yielding from 5.05 to 5.47 per cent	48,260,000	
8 issues yielding from 5.50 to 5.90 per cent	20,690,000	
3 issues yielding from 6.00 to 6.30 per cent	10,434,000	
5 issues yielding from 6.50 to 6.90 per cent	26,050,000	
1 issue yielding 7.47 per cent	1,000,000	
69 issues		$785,584,000
Notes (average yield 4.30 per cent)		
5 issues yielding from 3.00 to 3.75 per cent	62,000,000	
5 issues yielding from 4.00 to 4.75 per cent	54,000,000	
6 issues yielding from 5.00 to 5.54 per cent	33,500,000	
2 issues yielding 6.00 per cent	13,000,000	
18		162,500,000
Debentures (average yield 4.82 per cent)		
3 issues yielding from 4.40 to 5.20 per cent		135,000,000
Preferred stock (average yield 5.17 per cent)		
3 issues yielding from 4.83 to 5.10 per cent	70,475,000	
4 issues yielding from 5.50 to 7.07 per cent	21,845,000	
7 issues		92,320,000
Common Stock		
Rights		166,338,193
Total public sales		1,341,742,193
Estimated local sales to customers		159,000,000
All financing		1,491,742,193

of operations, banking interference has decreased very appreciably.

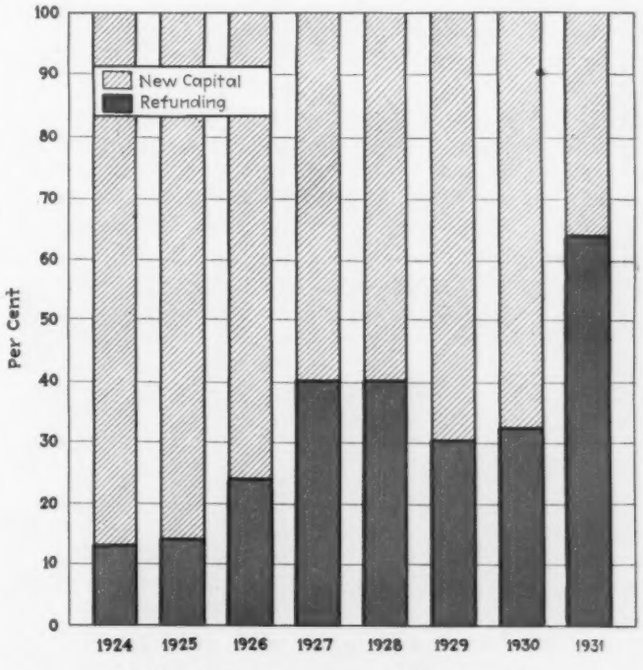
During the first half of the past year the market was reasonably receptive to senior issues and financing was carried out on a scale comparable to that of 1930. With the beginning of the second half year it became increasingly difficult for the bankers to market securities owing to unsatisfactory market conditions, declining business, bank failures, the cutting and passing of dividends and other conditions attendant upon the most severe depression on record. Large issues of the highest grade offered during the summer were moved with difficulty and the bankers discouraged further financing. During October not a single issue was sold. In November and December a few bond issues were offered and readily absorbed, but the volume the market would absorb was very definitely limited. Many large issues were delayed more or less indefinitely because of conditions.

During the year several of the leading utilities carried out extensive customer-ownership campaigns with success, but the total for the year fell below the average. Rights to subscribe to stock were offered to a total of about $166,000,000, but there is little evidence that this total has been actually secured, unless through the underwriting process. Junior financing other than customer sales and rights executed totaled approximately $100,000,000.

Of the total of capital raised in 1931 a much smaller amount actually went into new construction than for many years. Only 36 per cent of the money raised was new capital and the balance of 64 per cent was for refunding purposes. This has naturally resulted in further substantial reductions in carrying charges. The total amount of capital secured for all purposes in 1931 was within 6 per cent of the 1930 total, which was exceeded only twice, viz., during 1927 and 1928. The depressed condition of business led to a postponement of many new developments, mergers, etc., which would otherwise have been consummated. Several small receiverships have been necessary during the year and in the majority of cases the alleged cause was inability to carry out adequate financing operations. Totals involved in such situations, however, were an exceedingly small, if not negligible, proportion of total invested capital. The record of the great majority of power and light companies during this period is regarded by independent observers as further irrefutable evidence of the inherent stability of this industry.

The cost of capital to the power and light companies has receded still further during 1931. The average cost of mortgage bond money during the year was 4.67 per cent, against 4.97 per cent in 1930 and around 5.40 per cent in 1929. The average money cost in the case of debentures sold was 4.82, against 5.64 per cent in 1930, and in the case of preferred stock sold publicly, 5.17 per cent, against 5.94 the previous year.

With regard to the outlook facing the industry over the next decade, there seems little to fear. Especially during the present period costs are being and have been reduced to a minimum. The industry enjoys a highly favorable credit position. Its capital structures have been improved and made more flexible year by year. Public and institutional investing is shown by last year's experience to be something that can, generally speaking, be counted on in good times and bad. Current conditions point to annual requirements of at least $1,500,000,000. Present unsatisfactory conditions have at least achieved a degree of liquidation which promises well for the future, especially in an industry still so far from anything of the nature of saturation.



Refunding sets new high record

Statistics on the World Electric Power Industry

(Courtesy of the Electric Equipment Division, Department of Commerce)

	Year	Installed Capacity of Public Utilities in Kilowatts: Hydro	Steam	Diesel and Other	Total	Production in 1,000 Kw.-Hr.: Public Utilities	Industrial Plants	Railways and Tramways	Total	Consumption in 1,000 Kw.-Hr.: Domestic (Household)	Commercial	Industrial and Other	Total	Consumers: Domestic (Household)	Commercial	Industrial and Other	Total
Austria	1927	517,830	227,830	70,810	816,470	1,460,000	900,000	290,000	2,650,000	770,000	.....	1,385,000	.....	.....	.....	.....	.....
Azores and Madeira Islands	.....	4,336	318	2,875	7,529	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	1930	15,000	1,500,000	178,000	1,693,000	1,800,000	2,516,000	13,000	4,329,000	185,000	.....	1,270,000	.....	1,200,000	.....	253,000	.....
Bulgaria	1929	38,488	45,579	10,419	94,486	.....	.....	.....	86,255	16,379	.....	53,890	.....	.....	.....	.....	.....
Czechoslovakia	1928	114,243	1,184,920	60,297	1,359,460	.....	.....	.....	2,748,537	234,089	.....	2,614,448	.....	1,607,240	.....	.....	.....
Denmark	1928-1929	13,000	215,788	117,851	346,639	331,000	170,000	.....	.....	109,800	.....	164,000	.....	718,000	.....	14,000	.....
Estonia	1930	5,001	20,425	2,425	27,851	23,256	51,633	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Finland	1928	256,000	212,000	19,000	487,000	.....	.....	.....	.....	165,000	.....	1,168,000	.....	.....	.....	.....	.....
France	1928	2,022,732	4,936,545	.....	6,959,277	12,976,071	.....	.....	.....	2,009,267	.....	9,689,087	.....	6,339,266	.....	.....	.....
Germany	1929	.....	.....	.....	12,416,000	16,391,000	14,269,000	.....	.....	3,330,000	130,000	9,780,000	13,240,000	9,744,164	407,362	36,746	10,188,272
Gibraltar	1929	.....	2,000	.....	2,000	2,280	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4,190
Greece	1929	6,100	70,000	.....	76,100	102,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hungary	1929	3,187	361,630	22,780	387,597	.....	.....	.....	697,000	120,561	13,956	341,108	475,625	2,225,515 (Domestic & Com'l)			.....
Iceland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Irish Free State	1930	69,520	51,870	12,050	133,440	110,000	9,000	16,300	135,300	29,500	.....	34,000	.....	37,700	24,000	2,730	64,430
Italy	1929	3,470,721	568,176	89,375	4,128,272	9,116,723	.....	.....	.....	7,853,340	.....	.....	.....	.....	.....	.....	.....
Latvia	1929	1,461	39,664	2,297	43,422	80,492	30,000	.....	.....	23,005	.....	80,357	.....	.....	.....	.....	.....
Lithuania	1929	200	10,000	4,500	14,700	.....	.....	.....	.....	9,000	.....	7,000	.....	.....	.....	.....	29,200
Malta, Gozo and Cyprus	.....	.....	.....	.....	1,700	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Netherlands	1930	512	942,863	1,573	944,948	.....	.....	.....	1,507,822	.....	.....	.....	1,379,641	.....	.....	.....	.....
Norway	1929	1,612,341	.....	78,171	1,690,512	.....	.....	.....	10,500,000	.....	.....	.....	.....	.....	.....	.....	.....
Poland and Danzig	1929	.....	.....	.....	1,273,525	978,000	2,045,000	25,246	3,048,246	279,337	.....	2,743,670	.....	552,702	.....	133,514	.....
Portugal	1929	36,006	87,948	20,267	144,221	187,158	53,268	.....	.....	43,907	.....	161,100	.....	.....	.....	.....	.....
Rumania	1930	89,742	640,737	453,397	1,183,876	299,700	.....	.....	.....	.....	.....	1,407,514	.....	.....	.....	.....	.....
Soviet Russia in Europe	1930	.....	.....	.....	2,249,000	.....	.....	.....	12,700,000	.....	.....	.....	.....	.....	.....	.....	.....
Spain	1929	796,210	300,124	.....	1,096,334	.....	.....	.....	2,432,904	343,926	.....	1,634,984	.....	.....	.....	.....	.....
Sweden	1929	.....	.....	.....	1,170,808	.....	.....	.....	4,982,000	530,000	.....	3,834,000	.....	840,000	.....	14,031	.....
Switzerland	1929	1,202,121	83,450	23,541	1,309,112	.....	.....	.....	3,736,000	.....	.....	.....	3,736,000	842,530	81,428	8,562	932,520
United Kingdom	1928	42,208	5,670,758	88,804	5,801,770	9,323,690	.....	.....	.....	2,035,700	127,800	5,636,600	7,800,100	.....	.....	.....	2,993,939
Yugoslavia and Albania	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canada	1930	4,531,750	785,767	62,563	5,380,080	18,000,000	1,290,000	20,600	19,310,600	.....	.....	.....	.....	1,207,457	215,728	40,820	1,464,005
British Honduras	1930	.....	.....	330	330	725,360	.....	.....	.....	.....	.....	.....	.....	950	.....	.....	.....
Costa Rica	1930	14,160	.....	565	14,725	.....	.....	.....	.....	19,221	6,201	4,624	29,947	15,183	1,665	700	17,548
Guatemala	.....	20,240	512	479	21,231	.....	.....	.....	.....	.....	.....	.....	.....	20,413	2,918	820	24,151
Honduras	.....	2,306	4,983	686	7,975	4,490	11,915	.....	.....	3,490	352	9,915	13,757	4,900	688	160	5,748
Nicaragua	.....	188	700	2,373	3,261	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Panama	1930	187	6,065	679	6,931	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Salvador	.....	4,000	50	1,700	5,750	15,750	5,500	.....	.....	.....	.....	.....	.....	16,400	425	500	17,325
Greenland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mexico	.....	262,155	200,177	1,231	463,563	2,000,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Miquelon and St. Pierre Is.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Newfoundland and Labrador	.....	141,800	350	280	142,430	14,500	780,000	500	795,000	.....	.....	.....	.....	15,000	1,200	275	16,475
Bermudas	.....	.....	.....	3,220	3,220	.....	.....	.....	.....	6,000	.....	.....	.....	6,000	.....	.....	.....
Barbados	.....	.....	.....	1,120	1,120	.....	.....	.....	.....	301	.....	775	.....	4,333	.....	.....	.....
Jamaica	1930	900	4,500	470	5,870	6,014	.....	1,828	.....	640	1,239	2,465	4,344	4,311	2,605	164	7,080
Trinidad and Tobago	.....	.....	.....	2,060	2,060	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other British West Indies	.....	.....	.....	2,500	2,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cuba	1930	683	11,119	122,576	134,378	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dominican Republic	.....	25	12,353	4,186	16,564	12,500	.....	.....	.....	.....	.....	.....	.....	9,628	.....	.....	.....
Netherland West Indies	.....	.....	.....	450	450	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
French West Indies	.....	.....	.....	1,000	1,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Haiti, Republic of	1930	160	425	1,540	2,125	4,653	.....	.....	.....	608	605	2,440	3,653	3,667	251	76	3,994
Virgin Islands of U. S.	1930	.....	.....	900	900	.....	.....	.....	.....	156	.....	472	.....	.....	.....	.....	.....
Argentina	1928	.....	.....	.....	1,000,000	.....	.....	.....	800,000	.....	.....	.....	.....	1,400,000	.....	.....	.....
Bolivia	.....	12,179	500	1,105	13,784	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brazil	1928	566,887	108,351	.....	675,238	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chile	1928	139,682	65,634	.....	205,316	.....	.....	.....	305,528	.....	.....	.....	271,376	135,501	.....	.....	.....
Colombia	1931	.....	.....	.....	34,222	24,294	.....	.....	.....	3,811	12,115	5,224	21,150	21,738	2,907	526	25,171
Ecuador	.....	6,099	.....	6,640	12,739	30,975	3,434	.....	.....	16,261	.....	5,904	.....	19,081	4,119	357	23,557
Falkland Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British Guiana	.....	.....	5,625	130	5,755	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
French Guiana	.....	.....	.....	600	600	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Paraguay	.....	500	3,050	200	3,750	12,316	.....	.....	.....	10,469	.....	.....	.....	.....	.....	.....	.....
Peru	1929	38,900	1,500	6,431	46,831	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Uruguay	1929	.....	40,000	10,566	50,566	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Venezuela	1929	2,769	2,700	19,249	24,718	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Aden	.....	.....	795	.....	795	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Arabia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British India	.....	721,040	208,006	46,390	975,436	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
British Malaya	.....	46,927	58,200	5,199	110,326	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ceylon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
China	.....	.....	.....	.....	614,860	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Java and Madura	1929	92,300	68,600	43,300	204,200	.....	.....	12,300	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other Netherland East Indies	.....	.....	5,000	2,291	7,291	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

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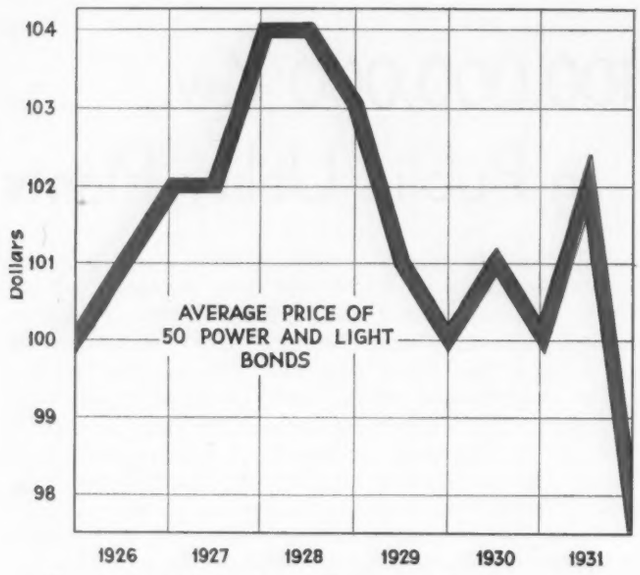


Bond trend has been downward since 1928

Stocks Back to 1925 Prices

Earnings and inherent values ignored.

Price gains of past six years swept away.

Dividend payments maintained.

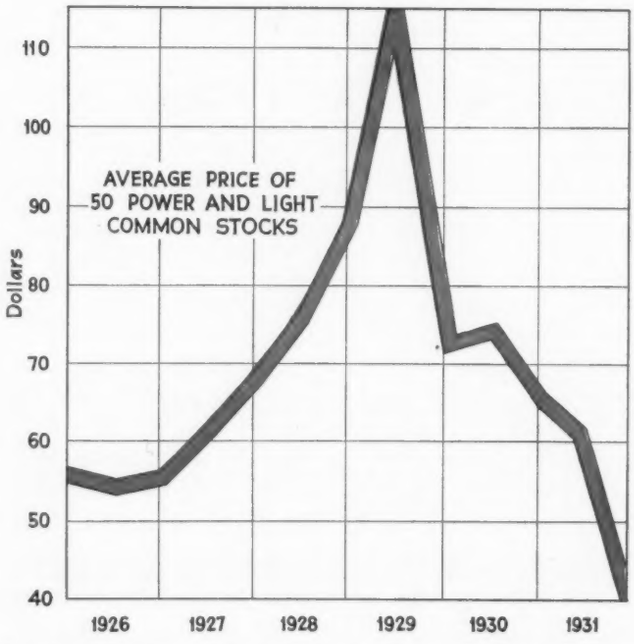
UTTERLY abandoning all thought of inherent worth, security holders continued during the greater part of 1931 to feed the avalanche of tumbling prices with their depreciated holdings. Earnings, prospects, asset value, gradually lost all significance under the urgent, and at times disorderly, attempt to get out of the market.

Utility common stock levels receded steadily during the year except when spasmodic buying movements took new crops of hopeful buyers aboard for the continued downward ride. Billions were written off securities values and stock averages were clipped to a fraction of their 1929 top prices. The average price of 37 utility common stocks closed the year around 36, having sagged from a high of 74 in March. This, however, does not fully reflect the extent of the decline in many individual issues. Average prices of holding company stocks are now around nine times last year's earnings, against a high of over 30 times earnings in 1929. Operating company stock averages are about twelve times 1930 earnings at present levels.

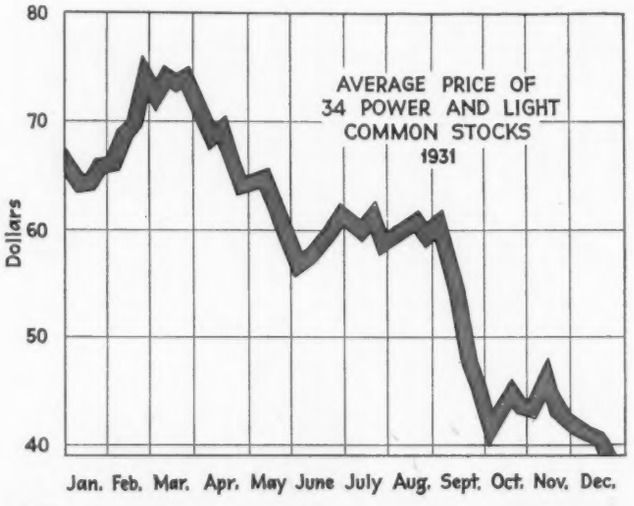
Preferred stocks as well suffered severely in the selling movement, although the unique record for maintenance of dividends by power and light companies was virtually unbroken. Twenty representative preferred issues closed the year with an average yield of well over 6 per cent. Many standard 6 per cent issues sagged from around par to somewhere between 50 and 65 late in the year.

The trend of utility bonds has been similar, if less marked. A group of 60 high-grade bonds compiled by Standard Statistics, Inc., shows a yield well over 5 per cent, against less than 4½ per cent three months ago. Another representative group of utility bonds averages approximately 72, against a high of 83 in July and an average of 78 at the beginning of the year. The decline in power and light company bonds slowed up decidedly in November and early December after a low point reached the first week of October.

Stocks of the electrical manufacturing companies shared the downward trend with little variation from the movement of other groups. The average of ten electrical manufacturing company common stocks has receded



Stock averages are halved. January and July prices



Market makes three faint attempts to recover

from a high for the year of 43, to 14, a 67 per cent decline. Earnings of most of these companies fell off sharply during the year. Orders booked by 84 manufacturers for the first three quarters, according to data compiled by the Bureau of the Census, was $564,305,419, against $835,964,369 for the same part of 1930 and $1,056,762,444 for the first three quarters of 1929.

The year closed with a very thin market for any type of security and unless investor confidence increases it is apparent that only high-grade bonds can be sold. Nor can any prediction be made as to stock market trends, for despite earnings and despite dividends the recession of utility stocks has been part of a national movement or reaction largely forced by the destruction of investor confidence. It is encouraging to note, however, that customer-ownership sales are made quite readily, showing the confidence of local customers in local properties. This outlet for junior securities promises to be utilized freely in 1932 to provide capital needed for business expansion.

Undoubtedly the recent experiences have shifted investor confidence from holding company to operating property securities in large measure, thus discounting the diversity asset of the holding company in favor of the physically tangible operating property. This semi-style change by investors will probably affect capital structures and financial policies of utilities in the future.

Security market conditions seriously affect the ability of the industry to grow and expand, in that capital expenditures are apt to be limited if it is necessary to make an undue proportion of the capital structure consist of bonds to secure the capital. Apparently market conditions will not improve until investor confidence in all securities is restored.

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Utility Taxes Mounting Faster than Revenues

ELECTRIC utilities are now contributing more than half a million dollars per day out of their revenues toward the cost of maintaining government—federal, state, county and municipal. In the last nine years the approach toward the million a day being paid by the railroads has been unusually rapid. In 1930 the railroads paid $348,000,000 in taxes and the electric utilities $203,000,000, a figure which will probably be slightly exceeded when the 1931 figures are available. Electric utilities alone have therefore become the tax-collecting agency for something like 1½ per cent of the funds required to support governmental activities of all sorts in the nation. One dollar in every sixty dollars required to meet the running expenses of all government is being collected from the ultimate taxpayer as an increment to his payments for electric service. In 1929 our elementary and secondary schools cost us $2,184,336,638, and therefore the tax on electric utilities amounts to a total that alone supports one-tenth of the educational burden.

Inasmuch as the gross revenue from electric utility operations in 1930 was $2,155,000,000, the total tax payments of $203,000,000 signify that about 10 cents out of every dollar paid by the ultimate electric consumer is turned over by the utilities to governmental agencies in the form of taxes. These total taxes paid by the utilities have grown at a rapid rate, but so have plant and equipment investment values of the electric service companies during the same period. The notable thing is that the rate of taxation has more than doubled over a period of 30 years. Much of the increase in rate took place in the war period; since that time it has been reasonably constant. This, at least, applies to the cents per dollar of plant value. It does not, however, apply to the portion of gross revenue which is claimed as governmental tax. This has been steadily mounting from 3.1 per cent in 1902 to 9.4 per cent in 1930, a more than threefold increase. Every ultimate utility customer today is paying more than three times as much tax when he pays his electric bill dollar as he did in the opening days of the twentieth century. Add to this his increased expenditure for intensified electric service and it is seen that the practice of tacking tax dollars onto the collections for kilowatt-hour consumption is becoming a matter of serious concern to the citizen and the customer as well as to the utility corporations.

One-fifth of net goes to tax

It is a matter of more than ordinary concern when the narrow margin of net operating revenue accruing to the utilities is drawn upon to the extent of one-fifth of that net for support of governmental expenditures. Rates and operations of the utilities must be so adjusted that five dollars of net can be earned in order that investors may receive four dollars of return on their investments in the electrical enterprise. Also, ten dollars must be taken from each customer in order that he shall have contributed nine dollars toward the necessary expense of operations and the cost of money loaned to conduct the utility business.

It is a moot question how far it is incumbent upon and proper for the utility industry to combat the inordinate increase in the expense of conducting modern government. This is a broad question of economics and polity far transcending the province of the utility business. There is, however, manifestly adequate justification for pointing out to customer and investor alike that the ease of collecting taxes from utilities has been encouraging

an increasing tendency to assess rapidly growing tithes upon the proceeds of the business.

Some of the enlarged assessment is attributable to the very ease with which such utility taxation can be applied and administered. The statistics of the industry are exposed to public and legislative gaze, and consequently it is to an extent explainable that readily available data should attract the attention of legislators and assessors away from industries and tax sources whose financial and statistical operations are much more obscure. Much of the tendency is, however, attributable to the stability and general prosperity of the electrical business and the political attention which these fortunate aspects have attracted.

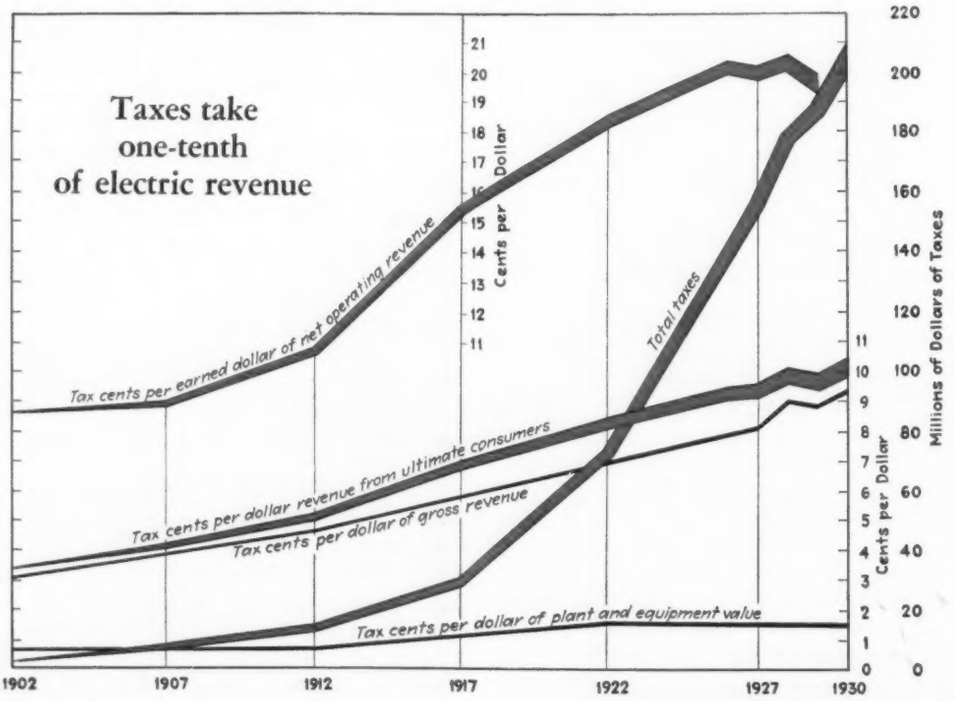
Not much increase this year

Actually there was little done, however, by the legislatures which met in 1931 toward enlarging the tax assessment on utilities. Idaho and South Carolina enacted laws imposing a half-mill tax on each kilowatt-hour generated or sold in those states. The tax on gross incomes and net incomes was left largely as it had been in all states. Of course, these magnitudes are of wide range (0.4 to 7.5 per cent), depending on whether they are assessed in addition to or in lieu of local property and franchise taxes. Tax on kilowatt-hour sales comes in the sales tax class in some minds and therefore faces a test of constitutionality and discrimination unless it is part of a broad sales tax program.

Inquiry reveals that proposals were made for taxation of utilities that would in many cases have been drastic, but sober scrutiny in the committees and in legislative halls lead to their extinction. The legislators seem to have learned that a tax imposed on the utility business comes back to the consumer more directly and more quickly than one imposed on almost any other line of business unless it be in the form of a sales tax. The boomerang feature appears to be the principal deterrent to proposals for punitive taxation and acts equally as a deterrent to the revenue-producing variety. The subject is in the air, nevertheless, and is likely to result in further increases in tax items unless the need for more governmental revenue subsides before the legislatures meet again.

If the American people are content to support extravagant expansion of governmental functions on the present plane they must expect to see their electric service, like everything else they buy, cost more by the amount of direct and indirect loading of the charges to cover amounts turned over to government for its support. They should, however, know for every commodity and every service they buy just how much of it goes to maintain the paternalistic enterprises which their legislators and their organized minorities foist upon government and upon the taxpayer. This can be shown very readily in the case of their electrical payments and should be so shown.

The great hazard to the electrical industry lies not so much in its exploitation for tax-gathering purposes as in the unfair disadvantage it establishes when comparisons are made with existing or contemplated municipal operation ventures, especially when those ventures are conducted on a tax-free basis. The consequence, then, is that the tax burden to support local government on the established plane is shifted to the privately owned enterprise. Other businesses suffer at the same time, and it is therefore incumbent upon the electrical industry to disclose the magnitude of its tax payments in order to display the correlation between the increasing tendency to load tax burdens on the utility industry at the same time that governmental ventures into utility service, conducted on a tax-free basis, are being promoted by state and national politicians.



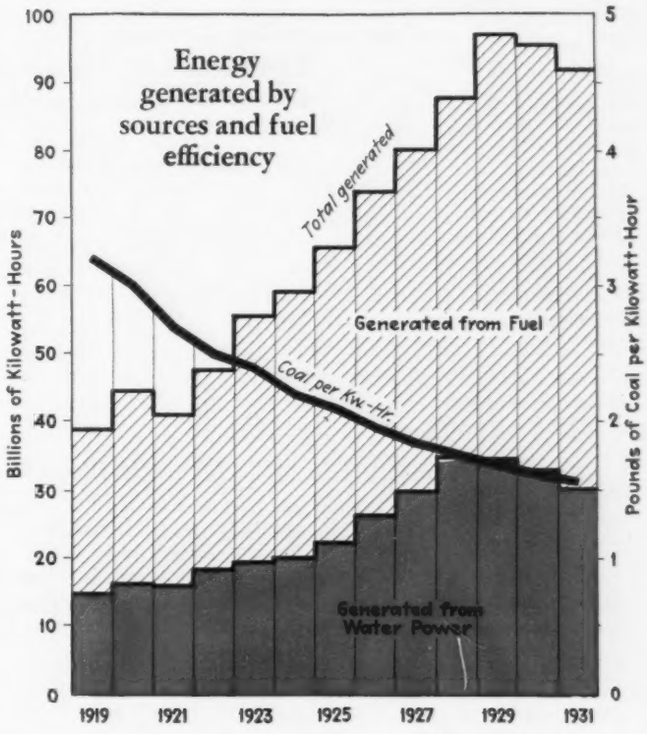
Greater Efficiency in Steam— Now 1.56 Lb. of Coal per Kw.-Hr.

STEAM power is the mainstay of electric energy production by public utility plants in the United States. It contributes two-thirds of the total output; during the past five years the percentages were, successively, 62.8, 60.5, 64.4, 65.6 and 67.2. The entire production from steam rose from 27,248,000,000 kw.-hr. in 1920 to 42,264,000,000 in 1925 and to 62,915,000,000 kw.-hr. in 1930. This was the maximum; there was a decrease of about 1,000,000,000 in 1931. These figures are for all public utilities, not for central stations exclusively; also, they include small amounts generated by internal-combustion engines, but not enough appreciably to affect the conclusions.

Installed steam capacity in public utility plants, as of November 1, was 25,230,370 kw., out of a total capacity of 35,086,188 kw. Of the steam, 23,687,454 kw. was in central stations, the total for the latter being 32,662,311 kw. Steam-driven generators therefore constitute 72 per cent of the whole, whether the larger or the smaller group is considered.

There has been progressive economy in the use of fuel. The average consumption of coal or its equivalent in 1931 was 1.56 lb. per kilowatt-hour. Every year has brought improvements. In 1919, the first year for which the Geological Survey collected statistics and the first for which comprehensive data on the subject are available, unit consumption was 3.2 lb. In a dozen years this has been cut in half, and the downward progress continues.

Within the electrical industry these improvements to some degree contributed to make possible reductions in energy rates, but since the cost of fuel has long been only a small fraction of the total expense of providing service at retail this influence cannot have much weight. The effect has been rather to relegate production costs to a position of less and less significance, at any rate in retail service. It would be well if the general public could be made aware of this. Much misunderstanding



*Output of Central-Station Hydro and Fuel Power Plants**

	Energy Generated During 1929					Energy Generated During 1930					Energy Generated During 1931†				
	Total	Hydro Plants		Fuel Power Plants		Total	Hydro Plants		Fuel Power Plants		Total	Hydro Plants		Fuel Power Plants	
	Millions of Kw.-Hr.	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Millions of Kw.-Hr.	Per Cent of Total	Millions of Kw.-Hr.	Per Cent of Total
UNITED STATES	91,420	32,390	35.4	59,031	64.6	89,950	30,562	34.0	59,388	66.0	86,678	28,382	32.7	58,296	67.3
New England	5,997	1,937	32.3	4,060	67.6	5,832	2,074	35.6	3,758	64.4	5,973	2,362	39.5	3,611	60.5
Middle Atlantic	21,605	5,707	26.5	15,898	73.5	22,003	5,408	24.6	16,595	75.4	21,420	4,990	23.3	16,430	76.7
East North Central	22,786	2,220	9.8	20,566	90.2	21,622	1,907	8.8	19,715	91.2	20,376	1,577	7.5	18,799	92.5
West North Central	5,387	1,464	27.1	3,923	72.9	5,739	1,333	23.2	4,406	76.8	5,617	1,140	20.3	4,477	79.7
South Atlantic	11,763	6,553	55.7	5,210	44.3	10,750	5,098	47.4	5,652	52.6	10,106	5,125	50.7	4,981	49.5
East South Central	3,398	2,628	77.4	770	22.6	3,546	2,682	75.6	864	24.4	3,640	2,903	79.8	737	20.2
West South Central	4,890	73	1.5	4,817	98.5	5,047	66	1.3	4,981	98.7	4,539	71	1.5	4,468	985
Mountain	3,785	3,157	83.4	628	16.6	3,496	2,862	81.9	634	18.1	2,953	2,299	77.6	654	22.4
Pacific	11,810	8,651	73.3	3,159	26.7	11,915	9,132	76.6	2,783	23.4	12,054	7,915	65.7	4,139	34.3

*By courtesy of the United States Geological Survey, with deductions for plants not considered electric light and power enterprises.
†Estimated on the basis of ten months' operations.

*Consumption of Fuel by Central-Station Steam Power Plants**

With deductions for utility plants not considered electric light and power properties
(100 per cent of the industry)

	Coal (Thousands Short Tons)			Fuel Oil (Thousands Barrels)			Gas (Millions Cubic Feet)		
	1929	1930	1931†	1929	1930	1931†	1929	1930	1931†
UNITED STATES	41,406	39,702	36,319	9,740	8,960	7,772	112,442	119,457	135,085
New England	2,679	2,312	2,101	1,524	1,641	1,542	0	0	0
Middle Atlantic	11,919	11,977	11,282	280	265	309	91	87	76
East North Central	16,674	15,317	14,072	80	107	121	4,071	4,276	3,053
West North Central	3,767	3,977	3,765	946	824	858	11,657	13,780	14,345
South Atlantic	3,659	3,926	3,213	2,219	2,221	2,115	153	94	81
East South Central	786	777	626	98	109	79	3,425	4,095	3,633
West South Central	1,219	861	716	926	1,091	526	65,299	70,396	67,003
Mountain	606	546	543	404	475	446	832	1,037	1,342
Pacific	97	9	1	3,263	2,227	1,776	26,914	25,782	45,552

*Data collected by U. S. Geological Survey. †Based on ten months' operations.

Comparison of Generating Capacity of All Public Utilities and Electric Light and Power Stations Only as of October 31, 1931

	All Public Utilities				Central Stations			
	Steam	Water Power	Internal Combustion	Total	Steam	Water Power	Internal Combustion	Total
New England	2,123,480	807,335	6,381	2,937,196	1,819,710	794,152	6,237	2,620,099
Middle Atlantic	7,262,930	1,353,552	21,419	8,637,901	6,422,030	1,233,392	20,979	7,676,401
East North Central	7,425,534	637,863	27,142	8,090,539	7,299,409	590,018	26,396	7,915,823
West North Central	2,008,677	471,731	143,374	2,623,782	1,925,668	454,072	140,652	2,520,392
South Atlantic	2,415,071	1,899,450	48,454	4,362,975	2,351,081	1,597,004	44,972	3,993,057
East South Central	735,086	948,340	22,434	1,705,860	727,271	689,920	21,651	1,438,842
West South Central	1,537,410	19,915	120,298	1,677,623	1,453,425	19,915	117,893	1,591,233
Mountain	322,655	784,776	38,166	1,145,597	290,863	759,251	37,222	1,087,336
Pacific	1,399,527	2,495,788	9,400	3,904,715	1,397,997	2,411,880	9,251	3,819,128
Totals	25,230,370	9,418,750	437,068	35,086,188	23,687,454	8,549,604	425,253	32,662,311
Added after October 31, 1931	.....	.....	.....	.....	200,000	60,000	.....	260,000
December 31, 1931, totals	.....	.....	.....	.....	23,887,454	8,609,604	425,253	32,922,311

Energy Generated in All Classes of Electric Utility Plants: Central Station, Railway and Other

Figures for 1928, 1929, and 1930 are taken from reports of the U. S. Geological Survey; figures for 1931 are for the twelve-month period ended October 31, 1931.

	Electrical Energy Generated (Thousands of Kilowatt-Hours)			
	1928	1929	1930	1931*
UNITED STATES	87,849,579	97,352,385	95,936,097	92,224,846
New England	5,958,843	6,608,790	6,399,730	6,440,308
Middle Atlantic	22,657,059	24,784,453	25,135,527	24,478,189
East North Central	20,946,994	23,333,008	22,164,922	20,871,606
West North Central	5,125,705	5,675,445	5,982,119	5,849,221
South Atlantic	10,499,780	11,901,577	10,894,956	10,200,888
East South Central	3,326,276	3,623,146	3,882,365	3,937,571
West South Central	4,035,380	4,896,023	5,054,845	4,629,444
Mountain	3,917,948	3,966,610	3,698,824	3,222,265
Pacific	11,381,594	12,563,333	12,722,809	12,595,354
NEW ENGLAND				
Maine	693,919	719,710	731,134	829,416
New Hampshire	301,514	310,138	367,380	552,998
Vermont	452,245	463,797	479,807	445,710
Massachusetts	2,751,468	3,026,426	2,907,556	2,774,871
Rhode Island	489,525	652,743	546,619	468,175
Connecticut	1,270,172	1,435,976	1,367,234	1,369,138
MIDDLE ATLANTIC				
New York	13,030,301	14,465,073	14,403,773	13,819,531
New Jersey	2,085,258	2,164,728	2,857,129	3,267,347
Pennsylvania	7,541,500	8,154,652	7,874,625	7,391,311
EAST NORTH CENTRAL				
Ohio	5,538,758	6,416,941	5,942,066	5,612,832
Indiana	1,989,495	2,575,930	2,942,814	2,876,970
Illinois	6,965,681	7,369,263	6,851,464	6,512,402
Michigan	4,346,637	4,695,266	4,269,998	3,897,042
Wisconsin	2,106,423	2,275,608	2,158,580	1,972,360
WEST NORTH CENTRAL				
Minnesota	1,065,262	1,202,307	1,310,836	1,350,427
Iowa	1,520,639	1,499,476	1,574,011	1,455,199
Missouri	990,792	1,220,661	1,269,045	1,267,449
North Dakota	85,385	104,979	124,667	135,474
South Dakota	105,887	107,738	114,260	103,183
Nebraska	464,291	533,235	574,839	594,136
Kansas	893,449	1,007,049	1,014,461	943,353

	Electrical Energy Generated (Thousands of Kilowatt-Hours)			
	1928	1929	1930	1931 *
SOUTH ATLANTIC				
Delaware	100,074	52,867	18,259	5,886
Maryland	1,477,025	2,010,799	1,869,497	1,694,998
Dist. of Columbia	467,206	505,122	548,408	574,350
Virginia	1,168,500	2,197,162	1,231,061	1,132,027
West Virginia	2,044,790	2,219,880	2,103,119	1,970,691
North Carolina	2,225,332	2,552,376	2,298,044	1,943,333
South Carolina	1,399,205	1,457,499	1,201,824	1,374,552
Georgia	981,072	1,135,539	937,229	843,391
Florida	636,576	670,333	687,515	661,660
EAST SOUTH CENTRAL				
Kentucky	625,149	715,351	719,014	757,021
Tennessee	956,094	1,020,957	1,036,955	1,095,404
Alabama	1,694,678	1,829,952	2,064,527	2,030,811
Mississippi	50,355	56,886	61,874	54,335
WEST SOUTH CENTRAL				
Arkansas	149,583	127,839	108,171	99,336
Louisiana	821,102	989,736	1,067,011	1,073,303
Oklahoma	843,794	977,132	958,094	790,768
Texas	2,220,901	2,801,316	2,921,569	2,666,037
MOUNTAIN				
Montana	1,619,351	1,613,668	1,319,800	996,702
Idaho	947,709	894,417	911,709	840,903
Wyoming	83,931	98,665	98,215	96,441
Colorado	541,150	563,813	573,341	533,954
New Mexico	52,326	67,179	75,871	70,653
Arizona	335,755	283,023	384,443	405,172
Utah	282,791	402,005	292,550	256,546
Nevada	54,935	43,840	42,895	21,888
PACIFIC				
Washington	2,361,024	2,552,325	2,555,233	2,520,371
Oregon	1,040,743	1,161,386	1,219,250	1,211,263
California	7,979,827	8,849,622	8,948,326	8,863,720

*Twelve months ended Oct. 31.

of the immediate results to be expected would thereby be avoided.

The effect outside of the power industry deserves mention. During the past seven years the annual coal consumption has varied but little; growth of electrical output therefore has not greatly increased sales from the mines or added to railroad loads.

At the efficiency of 1919 and with the present load an additional 40,000,000 tons would be used annually, assuming oil and gas consumption to retain their proportional share of the total.

The accompanying tables permit of comparisons between statistics for all public utility electric plants and those for electric light and power only. The following table for the year 1930 or as of the end of that year, quoted from a report of the U. S. Geological Survey, will make clear the distinction between the several groups:

Type of Plant	Capacity, Kw.	Output Kw.-Hr.
Central stations	31,976,138	89,951,758,000
Electric railways	1,143,310	2,577,485,000
Steam railroads	274,560	699,438,000
Bureau of Reclamation	32,390	145,053,000
Public works	345,780	1,119,018,000
Manufacturing (contributing to public supply)	491,766	1,143,345,000
All public utilities	34,263,944	95,936,097,000

It will be seen that central stations constitute 93 per cent of the total. Regionally, steam power predominates everywhere but in the two Western groups of states. In the electric light and power group approximate equality exists in the East South Central States, where, in addition, Muscle Shoals and several large industrial plants contributing to the public supply materially increase the public utility total for water power.

Natural gas is the predominant fuel in the Pacific States, coming from the California fields. It contributes largely to the supply in the West South Central States. Its use has been increasing, until in 1931 it was 13 per cent of all fuel, thermally considered, while oil was 4 per cent. For comparative purposes the coal equivalent of oil is taken as 4.15 bbl. and of natural gas 21,800 cu.ft. per ton of coal.

Total Energy and Fuel-Generated Energy in Public Utility Plants

Including electric light and power, electric railway, Bureau of Reclamation and certain other plants generating energy for public consumption.

Year	Kw.-Hr. Generated in All Public Utility Plants (Millions)	Kw.-Hr. Generated from Fuel (Millions)	Coal Consumed (Millions of Tons)	Coal Equivalent of All Fuel† (Millions of Tons)	Pounds of Coal per Kw.-Hr ‡
1919	38,921	24,176	35.10	38.88	3.2
1920	43,555	27,248	37.13	41.43	3.0
1921	40,976	25,863	31.59	35.25	2.7
1922	47,659	30,240	34.18	38.01	2.5
1923	55,674	36,092	38.96	43.53	2.4
1924	59,014	38,808	37.56	43.14	2.2
1925	65,870	42,264	40.23	44.79	2.1
1926	73,791	47,274	41.32	45.86	1.95
1927	80,205	50,330	41.88	45.91	1.84
1928	87,850	53,154	41.35	46.39	1.76
1929	97,352	62,723	44.94	52.57	1.69
1930	95,936	62,915	42.90	50.65	1.62
1931*	92,225	61,944	39.87	48.04	1.56

*12 months ended Oct. 31.
†Includes oil and natural gas, but not wood.
‡Excluding output from wood-burning plants

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International Communication Advances

Telegraph, radio and cable services step forward with new connections.

American communications enterprises still in the lead.

New international connections established.

THE phenomenally rapid extension of international radio telephone services made in 1930 by an army of telephone engineers has been carried on further in 1931 and its account depicts a year of rapid progress. To the links existing in the beginning of the year, by which more than 30,000,000 telephone subscribers in North and South America, Europe, Australia, Java and French India could hold transoceanic speech with each other have been added other links, mostly supplemental in character, but epochal in the history of communications.

At the end of 1930 practically all telephone subscribers of the United States, Canada, Cuba and Mexico could talk not only with most telephone subscribers in Europe but also those of Argentina, Chile, Uruguay and Australia, as well as several of the largest transatlantic steamships while en route across the ocean.

New direct international radio telephone circuits put into operation in 1931 were those between South American countries and Australia, followed by the extension of the Australian service to the whole of the continent and to New Zealand; so-called "tandem circuits" were established between North America and Java, via second transmission stations at Amsterdam and Berlin; new circuits also being set up between Java and Australia and Java and Sumatra and Siam. In Latin countries new direct radio telephone circuits were set up between Chile and Spain, Spain and the Canary Islands and Spain and Minorca Island, all these connecting by land wire systems to other countries of Europe and North and South America. The services from the United States are conducted by the American Telephone & Telegraph Company, those in Latin American countries and Spain by the International Telephone & Telegraph Corporation and those of other European and far eastern countries

by the respective government telephone administrations.

Through utilization of existing radio telephone circuits many more land line systems connected with those of other countries during the year. Principal among these were the connection of United Kingdom telephones with those of Indo-China, Morocco and New Zealand; North America with Rumania, Latvia and Estonia; Sweden to Indo-China, Siam, Java and Australia; Finland to Java; Belgium to Siam; Germany to Indo-China; Latvia to Siam and Java; Czechoslovakia and Luxemburg to Siam and Indo-China; Netherlands and Hungary to Indo-China; Austria to Indo-China and Siam, and Switzerland to Morocco, Indo-China and Siam. Italy also established radio telephony to Sardinia.

Direct radio telephone circuits have been opened between the United States and Brazil, Brazil and Argentina, and Colombia with other South American countries. The Brazil circuit connects with all Bell telephones in the United States and Canada, and with Cuban and Mexican systems of the International Telephone & Telegraph Corporation. Other stations soon to open are for service between the United States and Hawaii, and Bermuda. Arrangements are under way for telephone service between Great Britain and India, Africa and Egypt, and between United States and Japan.

From experimental services it is to be seen that the next field to be conquered is regular telephony to moving trains and aircraft in flight. Train telephony has been commercially carried on both in Canada and Germany, and telephony from planes has been accomplished over vast distances.

Ultra short wave in favor

The most significant technical development in radio transmission during 1931 has been the successful employment of the ultra short wave. On a wave length of 7 in., with antenna only 1 in. in length, and power of but one-half a watt, telephone conversation was clearly carried out across the English Channel between Dover and Calais by means of the new "micro ray." With a power hardly sufficient to light a flashlight bulb, these rays showed themselves not subject to the fading usually encountered in radio transmission, or by fog or rain, as in the case of light waves. The "micro-ray" opens a veritable no-man's land of additional radio accommodations. Employment of this discovery shows the possibility of no ether congestion for many years to come. Its possibilities, in range of frequencies that can be used, are nine times that of the whole of the rest of the existing radio field.

While the range of the "micro-ray" is limited to the extent of theoretical visibility, the use of ordinary simple relays provides an almost unlimited extension of the range of such stations. Engineers of the International Telephone & Telegraph Corporation envisage that such a ray, not subjected to fog and rain, will very greatly extend the usefulness of lighthouses, for maintaining secret communication between aircraft and land, and between ships at sea, as well as its obvious potentialities for land use, particularly for telegraph and telephone to points inaccessible or uneconomical for expensive wired pole lines.

Through the micro-radion tube the voice of the speaker is carried through a tube generating waves which oscillate at the unthinkable rate of 1,600,000,000 times a second. Produced in quantity, these miniature transmitters might some day compete economically with general wire systems.

An important advance in short-wave radio telephony was reached by the perfection during the year by the same group of engineers of a method of single side-band transmission. While this method in general use on long waves is not new, its new use with a pilot wave system greatly improves transmission, reduces interruption or interference and requires only one-sixth of the normal transmitting power. Nearly twice as many radio stations can be operated by the single side-band method as is at present possible, without interference between them.

Following this, the same group of engineers demonstrated the spread side-band system for use on short-wave telephone links. It removed or reduced distortion effects. By an extension of the principles involved a number of side bands can be placed on one carrier wave in such relative positions to each other that the "harmonic distortion" of speech is eliminated, as well as is cross talk, or the mixing of conversations between adjacent circuits.

New telegraph printer exchanges

More understandable, perhaps, to the layman is the telephone conversation recorder marketed by a German company. This is the "Echophone" device, in which the conversation of both parties is recorded on a steel wire in such manner that it can be reproduced again at any later time. It is possible also to obliterate the message so that the wire may be used again. It is anticipated that one of the most important uses of the "Echophone" will be in long-distance telephone conversations, particularly transoceanic calls.

In telegraphy the most significant development of the year has been the establishment of telegraph timed wire service by which any business office or plant installing an ordinary telegraph printer can transmit messages on a time basis, to other printer subscribers. The message is typed on the transmitter in the sending office by any one having sufficient familiarity with the ordinary typewriter, automatically appearing in type at the receiving point. In this service the American Telephone & Telegraph Company has entered into competition with the telegraph companies, and for the first time in the history of competition between the Postal Telegraph Company and the Western Union these companies have joined in offering a nationwide co-ordinated service of "timed telegraphy."

Carrier-current telegraph equipment, little used heretofore in purely telegraph plants, shows evidence of wider future application in this field. Postal Telegraph has put in service a carrier-current system between New York and Washington by which 40 telegraph channels are added to a four-wire system.

The adoption by the International Telephone consulting committee of the Murray code, as used throughout America in teleprinter operation, at last provides all telegraph systems of the world with a uniform five-unit code.

In services the telegraph companies added their co-operation with the rapidly extending air lines of the country, one feature of which included arrangement for pick-up and delivery of packages for airplane shipment. The telegraph companies also added to their many other services the sale and encashment of travelers' checks, Postal Telegraph handling those of the American Bankers' Association and Western Union those of the

American Express Company. Both companies added a new service known as the serial day letter, which can be sent in several sections at one cumulative charge during any one day. Both also adopted the practice of indicating both sending and receiving times on telegrams. The assurance of continuing cable communications of the United States with China was obtained by the renewal of Chinese landing rights of the Commercial Pacific cable.

Advances in telephony

The record of the advances in American telephony is a separate account in itself. Since radio telephony from the United States has extended so widely, the accomplishments by connecting telephone systems abroad, particularly in Europe, are pertinent. First of all, it is pointed out, the telephone in America has been evolved so very much farther than in any other part of the world that developments abroad might seem relatively minor to Americans. But they are nevertheless of major importance to foreign publics, who are much too often harassed by the vagaries and erratic mysteries of telephone technique, and whose exasperation is too frequently not mollified by pompous or dilatory officialdom. When Americans themselves encounter such service abroad, whether they be there themselves or speak over radio telephone circuits, anything done by way of improvement becomes personally interesting.

Recent years have seen the extension of international telephone cable connections through Europe at a rate surprising when we consider telephony is administered by some thirty different administrations, most of them dealing in different languages. In recent years a European telephone cable system has been built up offering capacities of expansion to the corners of every country, but now generally serving only principal cities. This was added to in 1931 by new cable approaching 5,100 km. in length and containing more than 1,000,000 km. of copper wire conductors. The advance is somewhat lower than 1930, but is important. An American company with many foreign affiliations, the International Standard Electric Corporation, took substantial part in this development. Most important of the foreign telephone cable installations were those connecting Warsaw with Western Europe; the linking of the middle and southern Italian network to the north; a new cable between London and Liverpool, and London and Bristol; new cables in Denmark and Switzerland, and several cables in Spain. A new submarine telephone cable is being laid between Denmark and Sweden. An additional telephone cable was laid between Cuba and United States. In China, Hong Kong and Canton were connected by cable.

The use of carrier-current telephone systems has greatly increased the capacity of telephone cables abroad. Such were those between several cities of Italy, a dozen or so in Norway and Sweden, twenty in France, besides systems in Spain and installations between Bombay and Calcutta, India, and Singapore with the rest of the Federated Malay states.

The principal new long-distance connections in Europe were between Rumania and Germany, France and England; Oporto, Portugal, with principal European cities; Belgrade and London; Istanbul and Sofia. Hungary opened new direct circuits with London, Poland and Yugoslavia, which also permits further connections of Yugoslavia with other countries. Telephone connection between Sweden and Russia was opened. Finland and Italy established regular international service with each other.

Automatic telephony and radio telegraph

The temperamental annoyances found in some foreign cities where lady operators experience difficulty in achieving consistent co-operation have been markedly alleviated by installation of automatic telephone exchanges. In three cities—Istanbul, Cairo and Shanghai—automatic installations have solved the multi-lingual telephone problems incident to the number of languages spoken by their heterogeneous populaces. Other important automatic telephone exchanges opened or in installation were in cities in Mexico, Peru, Honduras, Argentina, and in Europe in England (London), France (Paris), Spain, Norway, Hungary, Switzerland, Czechoslavakia and Russia. Incidentally, during the year a step which should be beneficial to telephone development throughout the world was the reaching of a cooperative accord between the International Telephone & Telegraph System and the old established Ericsson concern of Sweden.

New radio telegraph circuits set up either by Mackay Radio Telegraph or R.C.A. Communications during 1931 from the United States to foreign countries were to Cuba, Austria, Czechoslovakia, China and the Philippines.

Other important new circuits were Paris-Shanghai, Paris-Teheran, Berlin-Teheran, Buenos Aires-Brussels, Buenos Aires-Asuncion (Paraguay), Shanghai-Bangkok, Dairen - Osaka, and London - Nairobi (Kenya, East Africa).

On the airways the companies themselves have cooperated to set up radio telegraph networks and the U. S. Department of Commerce built up in 1931 a national network of airways radio stations and radio beacons for dissemination of weather information and guidance of aircraft along the airways. The German Luft-Hansa Company opened to the air-traveling public the first regular plane-to-station radio telegraph service.

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We may expect, roughly, 123,000,000,000 kw.-hr. per year as the maximum possible output from water power in the United States at a cost three to four times larger than the equivalent output of steam power.

GEO. A. ORROK,
Combustion Engineer

Typical Domestic Energy Use

Average energy per home for 41 large utility systems increased 43 per cent in five years

Company	1925		1926	1927	1928	1929	1930	
	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sales per Customer per Year	Kw.-Hr. Sold to Residential Customers	Kw.-Hr. Sales per Customer per Year
NEW ENGLAND								
The Connecticut Light & Power Co.	16,236,089	316	335	382	437	482	61,880,264	550
Hartford Electric Light Co.	15,931,000	368	350	392	441	498	34,094,000	572
The Worcester Electric Light Co.	13,165,643	302	316	326	373	405	21,364,907	456
Total	45,332,732						117,339,171	
Weighted average		**330**	**335**	**371**	**422**	**468**		**536***
MIDDLE ATLANTIC								
The Philadelphia Electric Co.	107,057,718	333	370	391	410	476	292,529,643	564
Buffalo General Electric Co.	83,822,470	694	734	743	784	802	119,448,478	815
Pennsylvania Power & Light Co.	34,770,110	279	331	331	358	394	124,035,869	437
Penn. Central Power & Light Co.	12,968,105	379	412	449	454	477	26,208,526	525
Total	238,618,403						562,222,516	
Weighted average		**394**	**440**	**471**	**485**	**492**		**562***
EAST NORTH CENTRAL								
Pennsylvania-Ohio Power & Light Co.	26,639,435	472	476	498	500	564		
Commonwealth Edison Co.	323,219,000	476	494	521	562	592	537,314,000	667
Ohio Public Service Co.	25,223,854	457	414	458	504	556	43,082,761	631
Detroit Edison Co.	174,359,654	478	517	532	561	631	330,054,578	703
Toledo Edison Co.	30,672,610	437	392	414	464	518	46,817,420	551
Cleveland Electric Illuminating Co.	106,070,467	498	500	544	575	616	178,983,996	662
Central Illinois Light Co.	8,935,037	310	344	374	443	500	19,981,388	574
Wisconsin Public Service Corp.	7,277,520	283	280	302	347	393	12,843,439	410
Total	702,397,577						1,169,077,582	
Weighted average		**470**	**487**	**512**	**548**	**595**		**656***
WEST NORTH CENTRAL								
Northern States Power Co.	80,734,981	281	354	382	414	461	148,463,780	514
Minnesota Power & Light Co.	15,966,663	433	394	409	438	468	20,182,472	552
Kansas Gas & Electric Co.	15,256,802	370	387	425	454	509	28,957,850	565
Kansas City Power & Light Co.	41,055,468	446	467	507	553	586	66,698,960	636
Empire District Electric Co.	5,967,268	393	276	286	357	359	7,895,862	404
Nebraska Power Co.	19,604,728	420	444	455	544	542	33,446,875	589
Total	178,585,910						305,645,799	
Weighted average		**377**	**388**	**415**	**460**	**494**		**547**
SOUTH ATLANTIC								
Consolidated Gas, Electric Light & Power Co.	55,027,695	402	441	486	525	565	122,662,364	625
Carolina Power & Light Co.	5,818,447	319	363	412	435	494	29,506,221	587
Total	60,846,142						152,168,585	
Weighted average		**393**	**423**	**472**	**506**	**550**		**618**
EAST SOUTH CENTRAL								
Southeastern Power & Light Co.	21,321,481	324	352	411	435	538		
Birmingham Electric Co.	11,828,759	304	320	347	376	414	26,099,916	513
Memphis Power & Light Co.	10,490,936	333	617	396	444	493	21,969,960	573
Total	43,641,176						48,069,876	
Weighted average		**317**	**342**	**397**	**427**	**513**		**615***
WEST SOUTH CENTRAL								
New Orleans Public Service, Inc.	16,235,561	301	356	398	430	414	30,101,893	413
Texas Power & Light Co.	15,920,936	315	324	355	387	415	39,449,575	482
Houston Lighting & Power Co.	15,290,963	345	361	377	404	417	36,193,705	512
Oklahoma Gas & Electric Co.	18,824,840	342	308	337	356	399	43,625,459	445
Dallas Power & Light Co.	16,561,509	365	383	397	430	464	29,700,679	513
Fort Worth Power & Light Co.	10,323,569	390	358	312	352			
Total	93,157,378						179,071,311	
Weighted average		**340**	**344**	**366**	**391**	**418***		**469***
MOUNTAIN								
Montana Power Co.	16,548,715	463	516	493		605	34,665,871	681
Utah Power & Light Co.	30,045,109	388	405	436	442	527	58,930,327	729
Public Service Co. of Colorado	27,544,707	328	316	326	345	385	42,973,076	427
Idaho Power Co.	45,655,688	1,400	1,290	1,150	895	1,006	45,040,912	1,390
Total	119,794,309						181,610,186	
Weighted average		**517**	**512**	**500**	**470***	**551**		**685**
PACIFIC								
Portland Electric Power Co.	39,490,832	546	597	545	771	662	84,673,891	812
California-Oregon Power Co.	15,157,635	1,178	1,210	1,420	1,542	1,640	35,297,867	1,765
Northwestern Electric Co.	10,732,935	670	817	936	1,020	1,057	33,450,516	1,130
Los Angeles Gas & Electric Co.	38,265,656	382	388	440			179,057,512	1,155
Pacific Power & Light Co.	14,599,261	454	533	743	778	890	62,521,016	1,535
Total	118,246,319						395,000,802	
Weighted average		**508**	**592**	**603**	**714***	**728***		**1,130**
UNITED STATES TOTAL	**1,667,567,484**	**447**	**452**	**473**	**507**	**547**	**3,110,205,828**	**639**

*Adjusted for companies not reporting residential consumption in these years.

The Promise of the Domestic Load

IN THE interval from 1926 to 1931 domestic energy sales in the United States nearly doubled. They were 21 per cent greater in 1931 than in 1929 and 8 per cent greater than in 1930. This is much in excess of the rate of growth in number of customers and signifies greatly increased average use per customer.

That the change was general is evident from the table on the opposite page. In this representative group of companies the average sales per customer increased from 447 kw.-hr. in 1925 to 635 in 1930, the latest available year. The list includes all major companies for which the desired data for a series of years were to be found in the annual supplements to the ELECTRICAL WORLD, showing allocation of output of individual companies.

Appliances brought the increase

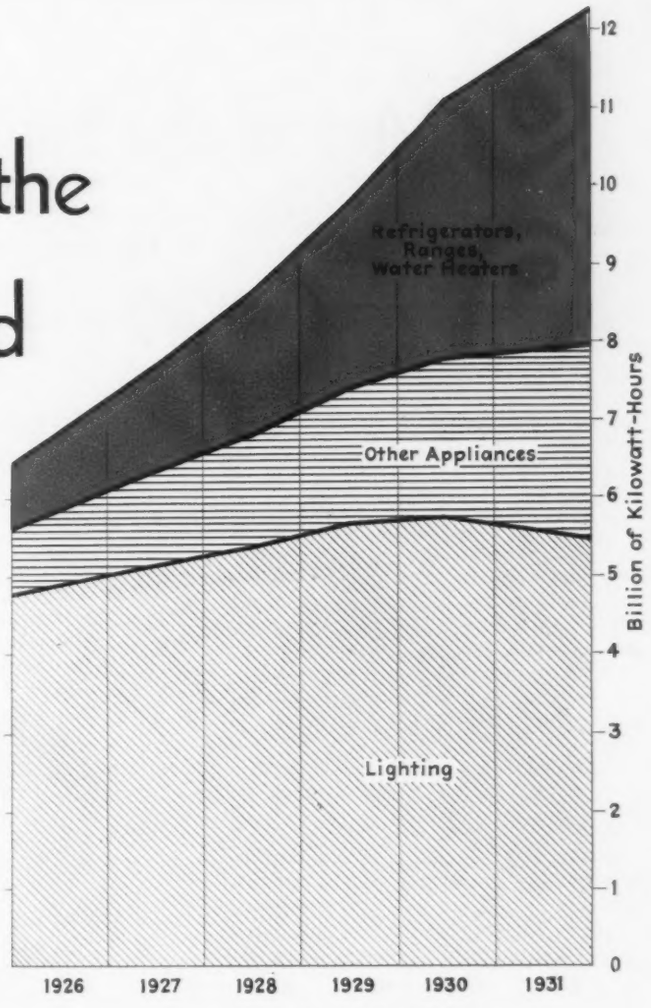
To what particular feature is this rapid increase in energy sales due? Have we as a people become more lavish in our home lighting or has something else happened? We used to think of electricity in the home in terms of lighting only; has there been a change?

In the search for an answer to these questions a table was compiled of the estimated number of electric appliances in American homes for each year since 1926, based largely on statistics published by *Electrical Merchandising*. The list comprised thirteen types—flat-irons, vacuum cleaners, washing machines, fans, toasters, percolators, socket-power radios, space heaters, ironing machines, oil burners, refrigerators, ranges, water heaters. Various other appliances are in use, but their aggregate energy consumption is relatively small.

Allowing for a moderate percentage of devices not in active use, and applying accepted values for the annual energy consumption of each device, we have, for each year of the study, the approximate energy used by the appliances then in service. In this way each device was worked out for each year.

According to this computation the total in 1926 was about 2,000,000,000 kw.-hr. In 1931 it approached 6,300,000,000 kw.-hr.—a threefold increase.

Further analysis reveals that the three heavy appliances—refrigerators, ranges and water heaters—contributed about three-fourths of the increase, the other ten contributed the rest. This statement should not be construed as minimizing the significance of the smaller appliances; they used 2,300,000,000 kw.-hr. in 1931 alone. But it is worth noting that, young as they are in a commercial sense, the three "heavy" appliances account for a third of the energy sales to domestic customers in 1931 and are largely responsible for the advance in average use from 550 kw.-hr. in 1930 to 580 kw.-hr. in 1931 per residential customer.



Six years of load building

Domestic energy sales analyzed, 1926-1931

While calculations of this sort necessarily lead to approximate results at best, the conclusions are so unmistakable that they would not be changed essentially by any probable inaccuracy in the data.

Some of these conclusions are:

1. The three major appliances mentioned now account for a third of the residential energy sales, with a larger yearly aggregate than the total domestic sales nine years ago, in 1922.

2. These sales are rapidly increasing. The number of appliances sold during 1931 will bring their proportionate share of the energy in 1932 to 40 per cent of domestic use.

3. The energy for all appliances here considered nearly equals that for lighting and other purposes.

4. With the diminishing number of customers that can possibly be added, energy for appliances holds the best promise of important increase in residential sales. This promise is large; only one customer in nine has an electric refrigerator, one in twenty a range, one in 80 a water heater.

Men of the Industry

California Edison Assigns New Executive Duties

Advancement of three officers of the Southern California Edison Company, Ltd., has been announced by John B. Miller, chairman, and R. H. Ballard, president, following the year-end meeting of the board of directors. GEORGE C. WARD, executive vice-president, will become senior vice-president, next in rank to the president. WILLIAM C. MULLENDORE, vice-president, is promoted to the position of executive vice-president and FRED B. LEWIS, vice-president and assistant general manager, is advanced to the position of vice-president and general manager.

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Hosmer, Edgar and Moultrop Advanced in Boston Edison

On account of the retirement of W. H. Atkins, vice-president and general superintendent of the Edison Electric Illuminating Company of Boston, on January 1, after 44 years' service, SIDNEY HOSMER, LEAVITT L. EDGAR and IRVING E. MOULTROP have been advanced in official status as of that date. Mr. Hosmer, who has been vice-president and bureau head in charge of construction, has been named vice-president and assistant general manager, reporting directly to Charles L. Edgar, president and general manager; Leavitt C. Edgar, who has been vice-president and assistant general superintendent, becomes vice-president in charge of the operating bureau, and Mr. Moultrop, who is chief engineer, also becomes head of the construction bureau.

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FRANK ADAMS, assistant power engineer, has been made power engineer of the Jackson district of the Consumers Power Company.

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WILLIAM O. BATCHELDER, district manager of the General Electric Company in Chicago, has been elected president of the Electric Association of Chicago.

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L. E. MERROW has been appointed superintendent of production in charge of station and transmission line operation for the Rockland Light & Power Company, with headquarters at Middletown, N. Y. Mr. Merrow is well known in the northeastern power field, having formerly been chief engineer of the Green Mountain Power Corporation, of Burlington and Montpelier, Vt., and more recently associated with the engineering staff of the New England Public Service Company, Augusta, Me.

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G. L. Jackson Directs Sales for Western Utility

GLENN L. JACKSON, recently elected vice-president in charge of sales of the California Oregon Power Company, as announced in the December 5 issue of the ELECTRICAL WORLD, was born in Albany, Ore. He attended Oregon State College, graduating from that institution in June, 1925. In September he

was employed by the Mountain States Power Company as appliance salesman in Albany, Ore., and in November of that year was transferred to Marshfield. He went from Marshfield back to Albany in January, 1926, and in the spring was transferred to Casper, Wyo., as appliance manager. Mr. Jackson was made sales manager of the Mountain States Power Company early in 1927 and two years later was made sales manager of the California Oregon Power Company also.

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HARVEY W. EDMUND, formerly commercial manager for the Western United Gas & Electric Company, Aurora, Ill., and more recently president of the Universal Heater Manufacturing Company, St. Louis, Mo., has joined the staff of Standard Management & Operating Corporation as assistant to H. L. Farrar, vice-president, with headquarters in San Francisco. Mr. Edmund will divide his efforts between merchandising and operating activities of certain companies operated by Standard Management & Operating Corporation.

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OBITUARY

L. S. Streng

LEWIS S. STRENG, vice-president in charge of operations of the Louisville Gas & Electric Company, died December 24 at his home in that city after an illness of several months. Mr. Streng, who was 55 years of age, had celebrated recently the twenty-fifth anniversary of his service with the utility company in Louisville, where he distinguished himself for many engineering achievements. In 1914 he supervised the piping of the first natural gas to the city and also the construction of the Beargrass gas plant ,the Ohio Falls hydro-electric station and the enlargement of the Waterside steam station.

A native of Louisville and a graduate of the Massachusetts Institute of Technology, Mr. Streng first established a connection with the General Electric Company at Schenectady, N. Y., from which he went to the Public Service Corporation of New Jersey. In 1906 he returned to his native state as chief engineer for the Kentucky Electric Company and seven years later, when that utility merged with the Louisville Lighting Company to form the Louisville Gas & Electric Company, he became chief engineer and general superintendent, being appointed to the office of vice-president in 1923. Mr. Streng was a member of the American Institute of Electrical Engineers, American Society of Mechanical Engineers, National Electric Light Association, American Gas Association, Engineers Club and Architects Club of Louisville, and the Association of Edison Illuminating Companies.

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C. J. PRENDERGAST, manager of the Bailey Meter Company's St. Louis office, was fatally injured in a building collapse at Paoli, Ind., November 20. He was rushed to a hospital, where he died of internal injuries the following day. After being graduated from Case School of Applied Science in 1925, Mr. Prendergast entered the employ of the Bailey Meter Company at Cleveland, a connection he maintained until his death. Before being transferred to St. Louis, he served as sales representative in the Boston and Springfield, Mass., territories.

New Equipment Available

Switching Unit for Motor-Driven Auxiliaries

A METAL-CLAD, 7.5-kv., self-contained switching unit has been developed by the Delta-Star Electric Company, Chicago, for controlling motor-driven auxiliaries. It is complete with solenoid-operated oil circuit breaker, current transformers, thermal relays, calibrating terminals and terminators for the supply and load cables.

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A NEW BASE, equipped with adjustable arms, for the Rockwood short-center drive has been announced by the Rockwood Manufacturing Company, Indianapolis, Ind. The motor is mounted on these adjustable arms and the drives are now adaptable to all types of motors, old or new, 25, 50 or 60 cycles, single or polyphase, a.c. or d.c. Each drive is completely engineered so that not only can the weight of the motor be placed so as to control belt tension as desired but the actual load required of the driven machine can be measured and provided for immediate installation. The Rockwood drive uses flat belt and flat paper pulleys in such a way that the drive is positive and yet flexible.

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AN AMTHOR OPERATION RECORDER which makes it possible to check and trace the basic causes for production loss on rotary-moving industrial machinery has been placed on the market by the Amthor Testing Instrument Company, Inc., Brooklyn. On an 8-in. round chart it automatically records and supplies a continuous visual picture of the entire day's run of the machine on which it is installed. The recorder movement is based on the centrifugal principle. Wear is eliminated by precision ball bearings packed in grease and which require no lubrication beyond once a year. The entire moving mechanism comprises a few parts, compactly assembled in a solid case which is moisture proof.

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A NEW LOW-MELTING POINT ALLOY, known as "Sil-Foss," has been developed by Handy & Harman, New York. It is recommended for use on copper, brass, bronze, nickel, nickel-silver, extruded brass and bronze, monel metal and other non-ferrous metals and alloys fusing above 1,300 deg. F. It contains a sufficient percentage of silver to give it easy flowing, penetrating and alloying properties. The melting point is given as 1,300 deg. F., which is even lower than silver solders containing less than 50 per cent silver.

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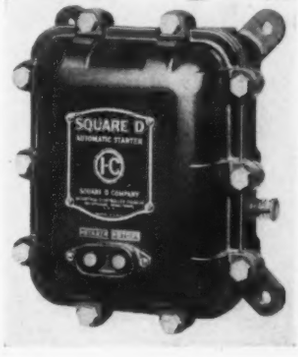
Explosion-Proof Starters

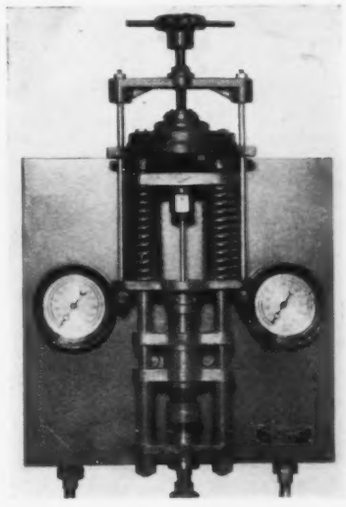
EXPLOSION-PROOF STARTERS designated types AR-1 and BR-1, for use in hazardous atmospheres, have been manufactured by the Industrial Controller Division of the Square D Company, Milwaukee, Wis. They have been approved by the Underwriters' Laboratory. Type AR-1 has a start-stop push button in the cover, while type BR-1 is designed for remote control. The starter mechanism consists of a ruggedly constructed three-pole magnetic contactor and thermal overload relays mounted on a porcelain base. An explosion-proof cast-iron inclosure surrounds the starter mechanism.



The starters provide low-voltage protection and release, also time limit overload protection to a.c. single and polyphase across-the-line motors. Maximum ratings are: 1½ hp., 110 volts; 3 hp., 220 volts, single phase; 5 hp., 220 volts; 7½ hp., 440-550 volts polyphase.

Relay Pressure Valve for Steam Control

A RELAY PRESSURE VALVE known as the style G, designed to give extremely accurate pressure control of steam, water or gas lines, has been announced by the Bailey Meter Company, Cleveland, Ohio. The relay valve controls the pressure within close limits by regulating the movement of a sylphon-operated or piston-operated throttle valve installed



in the line in which the pressure is to be controlled. A minute change in the controlled pressure will result in a relatively large change in the motive pressure used to operate the regulating valve.

Due to an exclusive feature enabling change of the seat gap by adjustment of micrometer-adjusting nuts, it is possible to obtain any desired speed or lag in amplified pressure connection. The application of this valve is unlimited as it can operate one valve, a series of valves or pistons.

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Single-Pole Toggle Flush Switch

A SINGLE-POLE, TOGGLE FLUSH SWITCH with small, shallow construction and a new type of switching mechanism has been announced by Cutler-Hammer, Inc., Milwaukee, Wis. The switching mechanism is a new C-H design of the jumper type, with heavy phosphor bronze contact material, non-stubbing contacts, compression type spring to give quick make and break, a positive-acting kick-off feature to eliminate burning and pitting of contacts and an arc horn on the movable contact which confines the arc to the extreme tip of the contact, thus keeping the actual contact area clean and free from pitting, the manufacturer states.

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